Precalculus Honors Semester 2 Review

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Precalculus Honors Objectives 9.1,9.2,10.1

1) Be able to expand a binomial using combinations or Pascal's Triangle.
2) Be able to expand $(a+b)^n$
3) Be able to solve probability questions with combinations and permutations.
4) Be able to solve conditional probability questions.
5) Be able to solve probability questions with binomial distributions.

Precalculus Honors Objectives 4.1,4.2,5.5 and 5.6

1) Be able to convert from degrees to radians and radians to degrees.
2) Be able to find arc length.
3) Be able to solve application problems with revolutions per unit of time.
4) Be able to solve application problems with bearing.
5) Be able to solve right triangle trig problems.
6) Be able to evaluate using the unit circle.
7) Be able to evaluate inverse trig problems.
8) Be able to determine how many triangles there are for an ASS triangle.
9) Be able to use the law of Sines. (Used for an ASS, AAS and ASA)
10) Be able to use the law of Cosines. (Used for a SSS and SAS)
11) Be able to solve application problems using Law of Sines and Law of Cosines.

Objectives Precalculus Honors Chapter 4.3-4.7

1) Be able to find all six trig functions given a point on the terminal side of an angle.
2) Be able to evaluate trig functions of large angles using coterminal angles.
3) Be able to graph y=sinx and y=cosx with transformations.
4) Be able to describe a sinusoidal function using sine and cosine.
5) Be able to graph y=cotx, y=tanx, y=secx and y=cscx with transformations.
6) Be able to evaluate inverse trig functions in intervals with and without a calculator.
7) Be able to solve inverse trig equations.
8) Be able to find the domain and range of inverse trig functions with transformations.

Objectives Precalculus Honors Chapter 5.1-5.4

1) Be able to simplify expressions using trig identities.
2) Be able to solve equations using trig identities.
3) Be able to evaluate expressions with trig identities.

Objectives Precalculus Honors Chapter 6.1-6.3

1) Be able to describe a vector in component form.

2) Be able to find the magnitude and direction.

3) Find component form of sums, differences and vectors multiplied by scalars.

4) Find a unit vector in direction of a given vector.

6) Describe a vector with a given magnitude in the direction of a given vector.

7) Be able to solve vector application problems with velocity.

8) Be able to solve vector application problems with combined forces.(Juana and Diego)

9) Be able to find the dot product.

10) Be able to determine if vectors are parallel or orthogonal.

11) Be able to solve work and incline application problems.

12) Be able to graph parametric equations with and without a calc.

13) Be able to eliminate the parameter.

14) Be able to describe a relation parametrically.

15) Be able to solve application problems with parametric equations.

Objectives Precalculus Honors Chapter 6.4-6.6

1) Be able to plot polar coordinates.

2) Be able to transform polar coordinates to rectangular and rectangular to polar.

3) Be able to transform polar equations to rectangular and rectangular to polar.

4) Be able to graph polar curves without a calculator.

5) Be able to convert trig form to polar and polar form to trig.

6) Be able to multiply and divide complex numbers in trig form.

7) Be able to use De Moivre's Theorem.

8) Be able to find the nth roots of a complex number.

Objectives Precalculus Honors Chapter 11.1 and 11.3

1) Be able to find average velocity.

2) Be able to estimate the slope of a tangent line.

3) Be able to use the definition of a derivative to find the slope of a tangent line at a point.

4) Be able to write an equation of a tangent line at a point.

5) Be able to use the definition of a derivative to determine whether a derivative exists at a point.

6) Be able to use the definition to find the derivative of a function.

7) Be able to use the definition to find the derivative at a point of a piecewise function.

8) Be able to evaluate limits.

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Memorize

$\tan^2 x + 1 = \sec^2 x$

$\sin^2 x + \cos^2 x = 1$

$\csc^2 x = 1 + \cot^2 x$

$\sin(A+B) = \sin A\cos B + \sin B\cos A$

$\sin(A-B) = \sin A\cos B - \sin B\cos A$

$\cos(A+B) = \cos A\cos B - \sin A\sin B$

$\cos(A-B) = \cos A\cos B + \sin A\sin B$

$u \cdot v = u_1v_1 + u_2v_2$

$u = \frac{v}{|v|}$

$\sin(2x) = 2\sin x\cos x$

$\cos(2x) = \cos^2 x - \sin^2 x$

$x = r\cos\theta$

$y = r\sin\theta$

$x^2 + y^2 = r^2$

for $z_1 = r_1 \operatorname{cis}\theta_1$ and $z_2 = r_2 \operatorname{cis}\theta_2$

$z_1 \cdot z_2 = r_1 r_2 \operatorname{cis}(\theta_1 + \theta_2)$

$\frac{z_1}{z_2} = \frac{r_1}{r_2}\operatorname{cis}(\theta_1 - \theta_2)$

$z^n = r^n \operatorname{cis}(n\theta)$

$z^{\frac{1}{n}} = r^{\frac{1}{n}} \operatorname{cis}\left(\frac{\theta}{n}\right)$ for $k = 0$

TRIG IDENTITIES

Sum and Difference Identities

$$\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$$
$$\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$$
$$\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$$
$$\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$$
$$\tan(\alpha+\beta)=\frac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$$
$$\tan(\alpha-\beta)=\frac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}$$

Memorize

$\cos^2 x+\sin^2 x=1$

$1+\tan^2 x=\sec^2 x$

$\cot^2 x+1=\csc^2 x$

Double Angle Identities

$$\sin 2\theta=2\sin\theta\cos\theta$$
$$\cos 2\theta=\cos^2\theta-\sin^2\theta$$
$$\cos 2\theta=1-2\sin^2\theta$$
$$\cos 2\theta=2\cos^2\theta-1$$
$$\tan 2\theta=\frac{2\tan\theta}{1-\tan^2\theta}$$

Power-Reducing Identities

$$\sin^2\theta=\frac{1-\cos 2\theta}{2}$$
$$\cos^2\theta=\frac{1+\cos 2\theta}{2}$$
$$\tan^2\theta=\frac{1-\cos 2\theta}{1+\cos 2\theta}$$

Half-Angle Identities

$$\sin\frac{\theta}{2}=\pm\sqrt{\frac{1-\cos\theta}{2}}$$
$$\cos\frac{\theta}{2}=\pm\sqrt{\frac{1+\cos\theta}{2}}$$

The sign is chosen based on the quadrant of $\frac{\theta}{2}$

$$\tan\frac{\theta}{2}=\frac{\sin\theta}{1+\cos\theta}\ or\ \frac{1-\cos\theta}{\sin\theta}$$

Exam

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the exact value of the real number y.

1) $y = \sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ 1) _____

A) $\frac{3\pi}{4}$ B) $\frac{\pi}{3}$ C) $\frac{2\pi}{3}$ D) $\frac{\pi}{4}$

2) $y = \sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$ 2) _____

A) $\frac{7\pi}{4}$ B) $-\frac{7\pi}{4}$ C) $-\frac{\pi}{4}$ D) $\frac{\pi}{4}$

Find the exact value of the composition.

3) $\cos\left(\arcsin\left(\frac{1}{4}\right)\right)$ 3) _____

A) $\frac{\sqrt{15}}{4}$ B) $\frac{4\sqrt{15}}{15}$ C) $\frac{\sqrt{15}}{2}$ D) $\frac{2\sqrt{15}}{15}$

4) $\arctan[\sin(\pi/2)]$ 4) _____

A) $\frac{\pi}{2}$ B) 1 C) 0 D) $\frac{\pi}{4}$

5) $\cos^{-1}\left(\cos\left(-\frac{\pi}{4}\right)\right)$ 5) _____

A) $\frac{\pi}{4}$ B) $-\frac{\pi}{4}$ C) $\frac{5\pi}{4}$ D) $\frac{3\pi}{4}$

Describe the transformation required to obtain the graph of the given function from the basic inverse trigonometric graph.

6) $f(x) = 9\cos^{-1} 2x$ 6) _____

A) Vertical stretch by a factor of 9 and horizontal shrink by a factor of $\frac{1}{2}$

B) Vertical translation up 9 units and horizontal translation to the right 2 units

C) Vertical stretch by a factor of 9 and horizontal stretch by a factor of 2

D) Vertical stretch by a factor of 2 and horizontal shrink by a factor of $\frac{1}{9}$

7) $f(x) = \arcsin\left(\frac{x}{6}\right)$ 7) _____

A) Horizontal stretch by a factor of 6

B) Vertical translation up 6 units

C) Horizontal shrink by a factor of $\frac{1}{6}$

D) Vertical stretch by a factor of 6

Find the exact solution to the equation without a calculator.

8) $\cos^{-1}(\cos x) = 1.8$ 8) _____

A) 0.9

B) 3.6

C) 1.8

D) None of the Above

Solve the problem.

9) A person is watching a car from the top of a building. The car is traveling on a straight road directly toward the building. When first noticed the angle of depression to the car is $22° 44'$. When the car stops, the angle of depression is $48° 36'$. The building is 260 feet tall. How far did the car travel from when it was first noticed until it stopped? Round your answer to the hundredths place. 9) _____

A) 370.24 ft B) 591.41 ft C) 391.31 ft D) 417.52 ft

10) A ship travels 87 km on a bearing of 22°, and then travels on a bearing of 112° for 136 km. Find the distance from the starting point to the end of the trip, to the nearest kilometer. 10) _____

A) 223 km B) 161 km C) 81 km D) 33 km

Use the fundamental identities to find the value of the trigonometric function.

11) Find $\cos\theta$ if $\sin\theta = -\frac{12}{13}$ and $\tan\theta > 0$. 11) _____

A) $\frac{12}{5}$ B) $-\frac{5}{13}$ C) $-\frac{13}{12}$ D) $-\frac{5}{12}$

Use basic identities to simplify the expression.

12) $\frac{\cos^2\theta}{\sin^2\theta} + \csc\theta \sin\theta$ 12) _____

A) $\sec^2\theta$ B) $\tan^2\theta$ C) 1 D) $\csc^2\theta$

Simplify the expression.

13) $(\sin^2 x + \cos^2 x) - (\csc^2 x - \cot^2 x)$ 13) _____

A) $\sin^2 x$

B) 2

C) 0

D) None of the above

14) $\frac{1 - \sin^2 x}{\sin x - \csc x}$ 14) _____

A) $\cos^2 x$ B) $-\sin x$ C) $\sin^2 x$ D) $-\cos x$

15) $\frac{1}{\csc x - \cot x} + \frac{1}{\csc x + \cot x}$ 15) _____

A) $\csc^2 x$ B) $2 \csc x$ C) $\csc x$ D) $2 \cot x$

16) $\frac{\cos x}{1 - \sin x} + \frac{1 - \sin x}{\cos x}$ 16) _____

A) $2 \csc x$ B) $2 \sec x$ C) 2 D) $\sec^2 x$

Write each expression in factored form as an algebraic expression of a single trigonometric function.

17) $\frac{\sin^2 x - 1}{1 + \sin x}$ 17) _____

A) $\sin x + 1$ B) $\sin^2 x + 1$

C) $\sin x - 1$ D) None of the Above

Find all solutions in the interval $[0, 2\pi)$.

18) $2 \sin^2 x = \sin x$ 18) _____

A) $x = \frac{\pi}{6}, \frac{5\pi}{6}$ B) $x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{3}, \frac{2\pi}{3}$

C) $x = 0, \pi, \frac{\pi}{6}, \frac{5\pi}{6}$ D) $x = \frac{\pi}{3}, \frac{2\pi}{3}$

19) $\sec^2 x - 2 = \tan^2 x$ 19) _____

A) $x = \frac{\pi}{4}$ B) $x = \frac{\pi}{6}$ C) No solution D) $x = \frac{\pi}{3}$

Find all solutions to the equation.

20) $4 \sin^2 x - 4 \sin x + 1 = 0$ 20) _____

A) $\left\{ \frac{\pi}{6} + 2n\pi, \frac{7\pi}{6} + 2n\pi \mid n = 0, \pm 1, \pm 2, ... \right\}$

B) $\left\{ \frac{\pi}{6} + 2n\pi, \frac{11\pi}{6} + 2n\pi \mid n = 0, \pm 1, \pm 2, ... \right\}$

C) $\left\{ \frac{\pi}{3} + 2n\pi, \frac{5\pi}{3} + 2n\pi \mid n = 0, \pm 1, \pm 2, ... \right\}$

D) $\left\{ \frac{\pi}{6} + 2n\pi, \frac{5\pi}{6} + 2n\pi \mid n = 0, \pm 1, \pm 2, ... \right\}$

Find an exact value.

21) $\cos 15°$ 21) _____

A) $\frac{-\sqrt{2} + \sqrt{6}}{4}$ B) $\frac{-\sqrt{2} - \sqrt{6}}{4}$

C) $\frac{-\sqrt{6} + 1}{4}$ D) None of the above

22) $\sin 105°$ 22) _____

A) $\frac{-\sqrt{6}+\sqrt{2}}{4}$ B) $\frac{\sqrt{6}+\sqrt{2}}{4}$ C) $\frac{-\sqrt{6}-\sqrt{2}}{4}$ D) $\frac{\sqrt{6}-\sqrt{2}}{4}$

23) $\sin \frac{-11\pi}{12}$ 23) _____

A) $\frac{\sqrt{6}+\sqrt{2}}{4}$ B) $\frac{-\sqrt{6}-\sqrt{2}}{4}$ C) $\frac{\sqrt{2}-\sqrt{6}}{4}$ D) $\frac{\sqrt{6}-\sqrt{2}}{4}$

State whether the given measurements determine zero, one, or two triangles.

24) $A = 43°, a = 3, b = 11$ 24) _____

A) Zero B) Two C) One

25) $A = 66°, a = 26, b = 28$ 25) _____

A) One B) Two C) Zero

Two triangles can be formed using the given measurements. Solve both triangles.

26) $C = 72°, a = 27, c = 26$ 26) _____

A) $A = 9°, B = 99°, b = 27$; $A = 171°, B = 81°, b = 27$

B) $A = 81°, B = 27°, b = 54.5$; $A = 99°, B = 9°, b = 54.5$

C) $A = 81°, B = 27°, b = 12.4$; $A = 99°, B = 9°, b = 4.3$

D) $A = 9°, B = 99°, b = 25$; $A = 171°, B = 81°, b = 25$

The given measurements may or may not determine a triangle. If not, then state that no triangle is formed. If a triangle is formed, then use the Law of Sines to solve the triangle, if it is possible, or state that the Law of Sines cannot be used.

27) $A = 41°, b = 14, B = 28°$ 27) _____

A) $C = 111°, a \approx 19.6, c \approx 27.8$

B) The triangle cannot be solved with the Law of Sines.

C) No triangle is formed.

D) $C = 111°, a \approx 10, c \approx 7$

Find the component form and magnitude of the indicated vector.

28) Given that $P = (-4, 8)$ and $Q = (-12, 7)$, find the component form and magnitude of the vector $\overrightarrow{PQ}$. 28) _____

A) $\langle -8, -1\rangle, \sqrt{65}$ B) $\langle -8, -1\rangle, 65$

C) $\langle 8, 1\rangle, \sqrt{65}$ D) None of the above

29) Given that $P = (-9, 4)$ and $Q = (-8, 13)$, find the component form and magnitude of the vector $\overrightarrow{PQ}$. 29) _____

A) $\langle 1, 9\rangle, 82$ B) $\langle -1, -9\rangle, \sqrt{82}$ C) $\langle -17, 9\rangle, \sqrt{370}$ D) $\langle 1, 9\rangle, \sqrt{82}$

Solve the problem.

30) A plane is heading due south with an airspeed of 211 mph. A wind from a direction of 53.0° is blowing at 17.0 mph. Find the bearing of the plane. (Note that bearings are measured from north, clockwise.) Round results to an appropriate number of significant digits. 30) _____

Skip

A) 184° B) 91° C) 86° D) 179°

31) A force of 623 lb is required to pull a boat up a ramp inclined at 22.0° with the horizontal. How much does the boat weigh? 31) _____

A) 1660 lb B) 578 lb C) 601 lb D) 2240 lb

Find the rectangular coordinates of the point with the given polar coordinates.

32) $(3, 2\pi/3)$ 32) _____

A) $\left(\frac{-3}{2}, \frac{3\sqrt{3}}{2}\right)$ B) $\left(\frac{-3}{2}, \frac{3}{2}\right)$ C) $\left(\frac{3}{2}, \frac{-3}{2}\right)$ D) $\left(\frac{3\sqrt{3}}{2}, \frac{-3}{2}\right)$

Determine two pairs of polar coordinates for the point with $0° \le \theta < 360°$.

33) $\left(-\frac{4\sqrt{3}}{2}, \frac{4}{2}\right)$ 33) _____

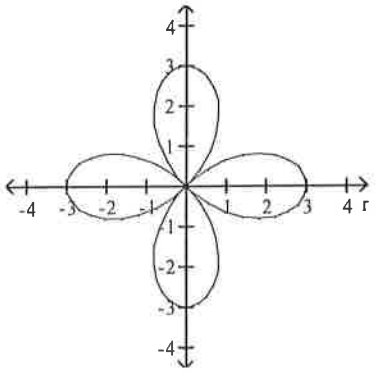
A) (4, 30°), (−4, 210°) B) (4, 150°), (−4, 330°)

C) (4, 300°), (−4, 120°) D) (4, 240°), (−4, 60°)

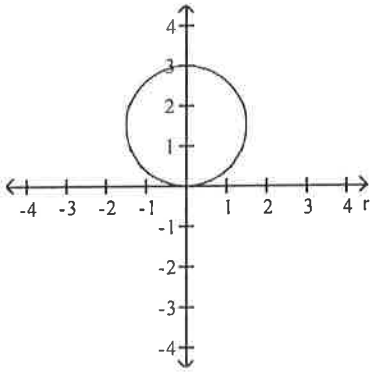
Use your grapher to determine which of the graphs matches the given polar equation.

34) $r = 3 \sin 2\theta$ 34) _____

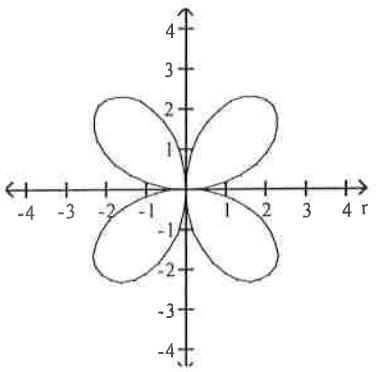
A)



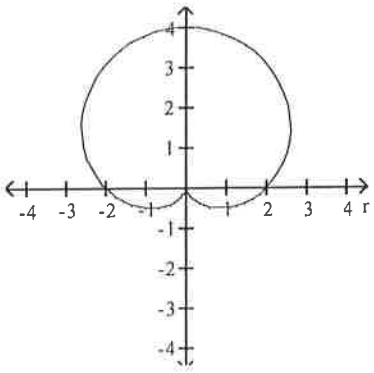
B)



C)



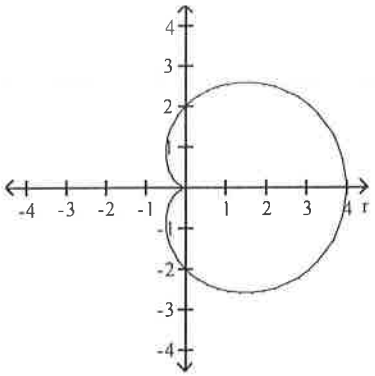
D)



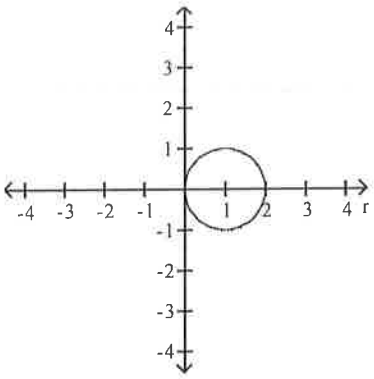
35) $r = 1 + 2 \cos \theta$

35) _____

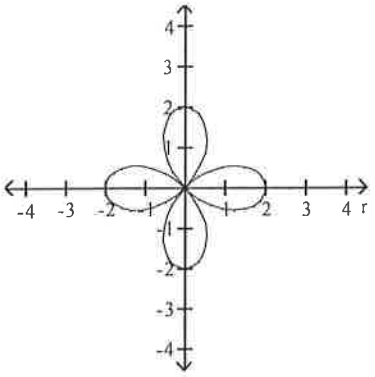
A)



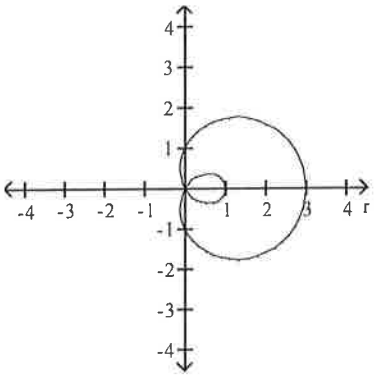
B)



C)

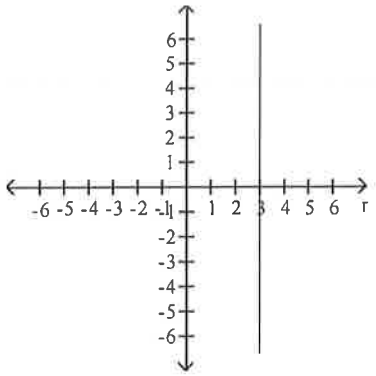


D)

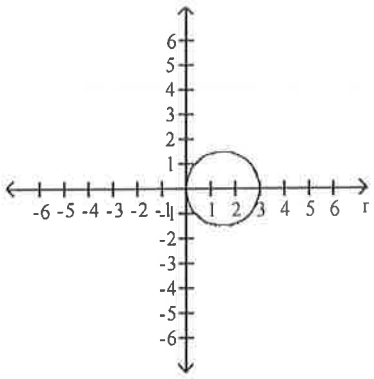


36) $r = 3 \csc \theta$ 36) _____

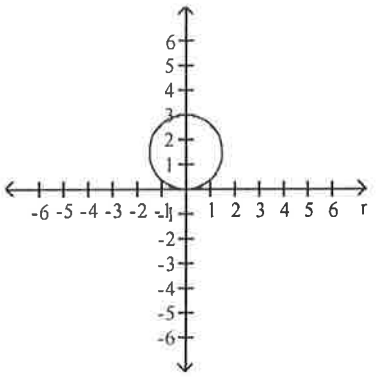
A)



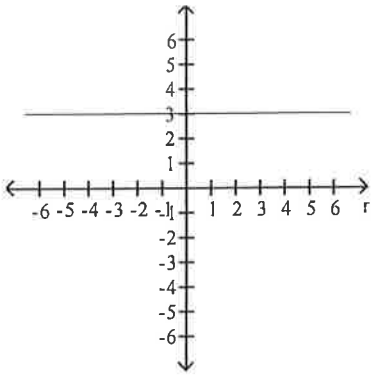
B)



C)



D)



Find an equivalent equation in rectangular coordinates.

37) $r - 4 \sin \theta = 6 \cos \theta$ 37) _____

A) $x^2 + y^2 + 4y = 6x$

B) $x^2 + y^2 = 0$

C) $\sqrt{x^2 + y^2} - 4y = 6x$

D) $x^2 + y^2 - 4y = 6x$

Find an equivalent equation in polar coordinates.

38) $x^2 + y^2 - 4x = 0$ 38) _____

A) $r = 4 \sin \theta$

B) $r \cos^2 \theta = 4 \sin \theta$

C) $r = 4 \cos \theta$

D) $r \sin^2 \theta = 4 \cos \theta$

Express the complex number in trigonometric form.

39) $5 - 5i$ 39) _____

A) $5\left(\text{cis}\,\frac{5\pi}{4}\right)$

B) $5\left(\text{cis}\,\frac{7\pi}{4}\right)$

C) $5\sqrt{2}\left(\text{cis}\,\frac{5\pi}{4}\right)$

D) None of the above

Find the product or quotient, as indicated. Leave your answer in trigonometric form.

40) Find the product of z_1 and z_2. 40) _____

$z_1 = 7(\text{cis } 70°)$, $z_2 = 5(\text{cis}155°)$

A) $35(\text{cis } 70°)$ B) $35(\text{cis } 10{,}850°)$ C) $12(\text{cis } 225°)$ D) $35(\text{cis } 225°)$

Write the complex number in the form a + bi.

41) $\frac{5}{2}(\text{cis } 150°)$ 41) _____

A) $-\frac{5\sqrt{3}}{4} + \frac{5}{4}i$ B) $-\frac{5\sqrt{3}}{4} + \frac{5}{2}i$ C) $-\frac{\sqrt{3}}{4} + \frac{1}{4}i$ D) $-\frac{\sqrt{3}}{4} + \frac{1}{2}i$

Find the indicated roots. Write the answer in a + bi form.

42) Cube roots of 8 42) _____

A) $2, 1 + \sqrt{3}i, -1 - \sqrt{3}i$ B) $2, -1 - \sqrt{3}i, 1 - \sqrt{3}i$

C) $2, -1 + \sqrt{3}i, -1 - \sqrt{3}i$ D) $2, 1 + \sqrt{3}i, 1 - \sqrt{3}i$

Find the derivative of the function at the specified point.

43) $f(x) = \frac{8}{x+2}$ at $x = 0$ 43) _____

A) - 32 B) 2 C) 8 D) -2

Find the equation of the tangent line to the curve when x has the given value.

44) $f(x) = 5x^2 + x; x = -4$ 44) _____

A) $y = 13x - 16$ B) $y = \frac{x}{20} + \frac{1}{5}$ C) $y = -\frac{4x}{25} + \frac{8}{5}$ D) $y = -39x - 80$

Find the definite integral by computing an area.

45) $\int_{-4}^{4} (2x + 8)\,dx$ 45) _____

A) 128 B) 32 C) 16 D) 64

Find the indicated limit, if it exists.

46) $\lim_{x \to 0} f(x)$, $f(x) = \begin{cases} 8 - x^2 & x < 0 \\ 8 & x = 0 \\ -5x + 8 & x > 0 \end{cases}$ 46) _____

A) 8 B) The limit does not exist.

C) -13 D) -5

Answer Key
Testname: SEMESTER 2 REVIEW

1) B
2) C
3) A
4) D
5) A
6) A
7) A
8) C
9) C
10) B
11) B
12) D
13) C
14) B
15) B
16) B
17) C
18) C
19) C
20) D
21) D
22) B
23) C
24) A
25) B
26) C
27) A
28) A
29) D
30) A
31) A
32) A
33) B
34) C
35) D
36) D
37) D
38) C
39) D
40) D
41) A
42) C
43) D
44) D
45) D
46) A

Precalculus Honors
Semester 2 Final Exam Review

These are NON-CALCULATOR problems except for #s 9, 10, and 12.

1. Find the range of the function $f(x)=5+2\cos^{-1}(3x)$

2. Find the exact value of $\sin 105°$

3. If $\sec\theta=-2$ and θ has its terminal side in Quadrant III, find the exact value of $\tan\theta$

4. What expression is equivalent to $\sin\left(\frac{\pi}{2}-\theta\right)$ for all values of θ?

5. Solve $\sin 2x=5\sin x$ for all values of x.

6. Consider the graph of $y=4-3\cos\left(\frac{\pi}{4}x-\frac{\pi}{8}\right)$. Find the...

   Phase shift: _____

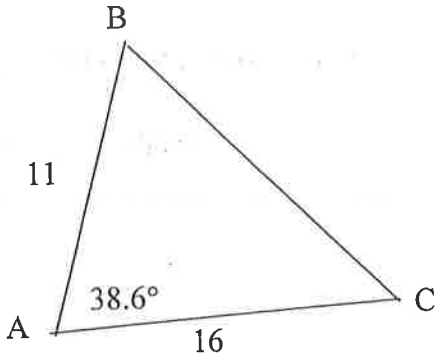
   Period: _____

   Amplitude: _____

7. solve $\cos\theta=-1$ for all values of θ

8. Evaluate: $\cos^{-1}\left(\cos\frac{5\pi}{4}\right)$

9. **(Calculator allowed)** Find the length of segment BC in the diagram at right.



10. **(Calculator allowed)** Find all solutions in radian form of $\sec\theta = 2.6$

11. Find the unit vector in the direction of the vector <5, 12>.

12. **(Calculator allowed)** A projectile is launched at an angle of 60° with the horizontal. It is launched from a height of 3 feet, and its initial velocity is 180 feet/sec.

    a) Write parametric equations to model the path of the projectile.

    b) The projectile is aimed towards a wall that is 20 feet tall. If the wall is 500 feet away, will the projectile clear the wall? If so, by how much?

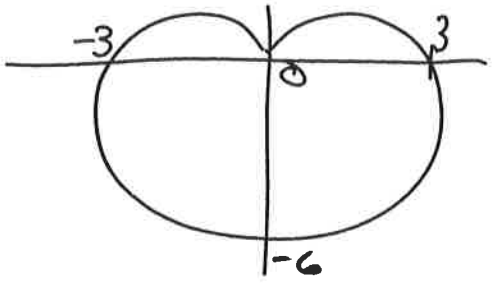
13. Convert the rectangular equation $x = 3$ to polar form.

14. Sketch a graph of $r = 3 - 3\sin\theta$

15. Find the limit, if it exists: $\lim_{x\to -3} \dfrac{x^3 + 27}{x + 3}$

Honors Precalculus

Semester 2 Exam Review Problems - Answer Key

1. $[5, 2\pi + 5]$
2. $\frac{\sqrt{6}+\sqrt{2}}{4}$
3. $\sqrt{3}$
4. $\cos\theta$
5. $x = k\pi$ for any integer k
6. a) $\frac{1}{2}$
   b) 8
   c) 3
7. $\theta = \pi + 2k\pi$ or $\theta = (2k+1)\pi$ for any integer k (or "odd multiples of π")
8. $\frac{3\pi}{4}$
9. 10.095
10. $\pm 1.176 + 2k\pi$
11. $\left\langle \frac{5}{13}, \frac{12}{13} \right\rangle$
12. a) $x = 90t$
    $y = -16t^2 + 155.88t + 3$
    b) yes, by 355.17 feet
13. $r = 3\sec\theta$ or $r = \frac{3}{\cos\theta}$
14. 

15. $\lim_{x\to -3} \frac{x^3+27}{x+3} = 27$ (note: $\lim_{x\to -2} \frac{x^3+27}{x+3} = 19$, but this is a less interesting question!)

Extra Review #2

Precalculus Honors Review semester 2

1. Given: $u = \langle 2, -1 \rangle$ and $w = \langle 1, -3 \rangle$. Find $|w - 2u|$.

2. Given: A = (2, -1), B = (3,1), C = (-4, 2) and D = (1, -5). Find the component form of $\vec{CD} - \vec{AB}$.

3. Given: A = (3,1) and B = (5,1). Find the unit vector in the direction of $\vec{AB}$.

4. Convert to rectangular coordinates: $\left(3, \frac{3\pi}{4}\right)$.

5. Write in parametric form. $y = -x^3 + 3x^2 - x + 2$

6. Evaluate: $|3 + 2i|$.

7. Write in a + bi form: $6(\cos(-30°) + i\sin(-30)°)$.

8. Write in trig form: $-1 + i\sqrt{3}$.

9. Given: $z_1 = 3cis50°$, $z_2 = 6cis150°$. Find:

   a. $z_1 \cdot z_2$

   b. $\frac{z_1}{z_2}$

   c. z_1^3

   d. $z_2^{\frac{1}{3}}$

10. Find the domain and range. $f(x) = 2 + 3\cos^{-1}\left(\frac{1}{2}x\right)$

Key ☺

Precalculus Honors Review semester 2

1. Given: $u=\langle 2,-1\rangle$ and $w=\langle 1,-3\rangle$. Find $|w-2u|$.

$\langle 1,-3\rangle - 2\langle 2,-1\rangle$

$\langle -3,-1\rangle$

$\sqrt{(-3)^2+(-1)^2} = \sqrt{10}$

2. Given: A = (2, -1), B = (3,1), C = (-4, 2) and D = (1, -5). Find the component form of $\vec{CD}-\vec{AB}$.

$\vec{CD} = \langle 1+4,-5-2\rangle$ $\vec{AB} = \langle 3-2,1+1\rangle$

$\vec{CD} = \langle 5,-7\rangle$ $\vec{AB} = \langle 1,2\rangle$

$\langle 4,-9\rangle$

3. Given: A = (3,1) and B = (5,1). Find the unit vector in the direction of $\vec{AB}$.

$\vec{AB} = \langle +2,0\rangle$ $u = \frac{v}{|v|}$ $u = \langle +1,0\rangle$

4. Convert to rectangular coordinates: $\left(3,\frac{3\pi}{4}\right)$.

$x = 3\cos\frac{3\pi}{4}$ $y = 3\sin\frac{3\pi}{4}$

$\left(-\frac{3\sqrt{2}}{2}, \frac{3\sqrt{2}}{2}\right)$

5. Write in parametric form. $y=-x^3+3x^2-x+2$

$x = t$

$y = -t^3+3t^2-t+2$

6. Evaluate: $|3+2i|$.

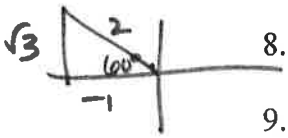
$\sqrt{3^2+2^2}$ $\sqrt{13}$

7. Write in a + bi form: $6(\cos(-30°)+i\sin(-30°))$.

$6\left(\frac{\sqrt{3}}{2}+i\left(-\frac{1}{2}\right)\right)$

$3\sqrt{3}-3i$

8. Write in trig form: $-1+i\sqrt{3}$



$2\,\text{cis}\,120°$

9. Given: $z_1 = 3cis50°$, $z_2 = 6cis150°$. Find:

a. $z_1 \cdot z_2$ $18\,\text{cis}\,200°$

b. $\frac{z_1}{z_2}$ $\frac{1}{2}\text{cis}(-100°)$

c. z_1^3 $27\,\text{cis}\,150°$

d. $z_2^{\frac{1}{3}}$ $6^{\frac{1}{3}}\text{cis}\frac{5\pi}{18}$ $6^{\frac{1}{3}}\text{cis}\frac{17\pi}{18}$ $6^{\frac{1}{3}}\text{cis}\frac{29\pi}{18}$

or

$6^{\frac{1}{3}}\text{cis}\,50°$ $6^{\frac{1}{3}}\text{cis}\,170°$ $6^{\frac{1}{3}}\text{cis}\,290°$

10. Find the domain and range. $f(x)=2+3\cos^{-1}\left(\frac{1}{2}x\right)$

D $[-1,1] \rightarrow [-2,2]$

R $[0,\pi] \rightarrow [0,3\pi] \rightarrow [2,3\pi+2]$

1) J.D. hits a ball from an initial height of 4 feet at an angle of 32° with an initial velocity of 150 feet per second toward a 20 foot fence that is 350 feet away. An 8 ft/sec wind is blowing in the same direction as the ball with an angle of depression of 10°.

a) Write the parametric equations to describe the path of the ball and the fence (include a t interval).

b) How long does it take for the ball to reach the fence?

c) How high is the ball when it reaches the fence? Will he hit a homerun?

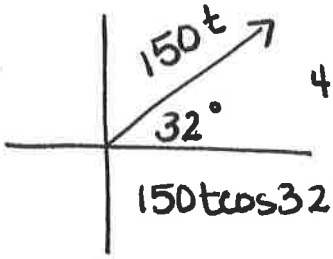
2) A plane flies 300 miles per hour with a bearing of 0° with a 40 mile per hour wind at a bearing of 60°.

a) Find the actual velocity vector of the plane

b) Find the actual velocity and direction of the plane.

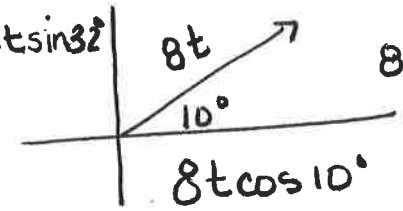
Key

① Ball



$4 - 16t^2 + 150t\sin 32°$

Wind



$8t\sin 10°$

Fence $x_1 = 350$ $0 \le t \le 4$

$y_1 = 5t$

Ball $x_2 = 150t\cos 32° + 8t\cos 10°$

$y_2 = 4 - 16t^2 + 150t\sin 32° - 8t\sin 10°$

ⓑ

$350 = 150t\cos 32° + 8t\cos 10°$

$350 = t(150\cos 32° + 8\cos 10°)$

$t = 2.59$ sec

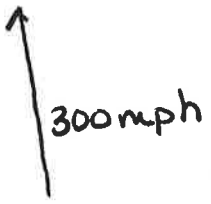
ⓒ

$y = 4 - 16(2.59)^2 - 150(2.59)\sin 32° - 8(2.59)\sin 10°$

$y = 98.94$ ft/sec

Yes! homeron

② Plane

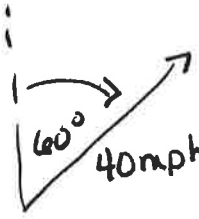


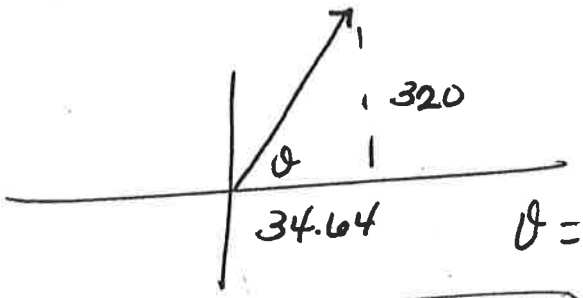
$\langle 300\cos 90° + 40\cos 30°, 300\sin 90° + 40\sin 30° \rangle$

$\langle 34.64, 320 \rangle$

321.87 mph

Wind





$\tan\theta = \frac{320}{34.64}$

$\theta = 83.82°$

Bearing 6.18°

PreCalculus Honors Name_____
Final Exam Review No Calculators

1. Give the smallest positive angle in radian measure if the point $(-1, \sqrt{3})$ is on the terminal side.

2. State the period of y = tan 2x.

3. State the phase shift of $y = -2\sin(3x - \frac{\pi}{3})$.

4. Evaluate the function: $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$.

5. Evaluate the function: $\tan^{-1}(0)$.

6. Solve for x in the domain $[0, 2\pi)$: $\csc x = -1$.

7. Solve for x in the domain $[0, 2\pi)$ $\sin 2x = 0.5$.

8. Evaluate: $\cos^{-1}(\cos\frac{-\pi}{3})$.

9. Evaluate: $\tan(\sin^{-1}\frac{3}{5})$.

10. Simplify: csc x – cos x cot x.

11. Solve for t in the domain $[0, 2\pi)$: cos 2t = cos t.

12. Simplify: $\cos(x + \frac{\pi}{2})$.

13. Given: $v = \langle 4, 2 \rangle$ and $w = \langle 1, -3 \rangle$. Find $v \bullet w$.

14. Given: $u = \langle 2, -1 \rangle$ and $w = \langle 1, -3 \rangle$. Find $|w - 2u|$.

15. Given: A = (2, -1), B = (3, 1), C = (-4, 2) and D = (1, -5). Find the component form of $\vec{CD} - \vec{AB}$.

16. Given: A = (3, 1) and B = (5, 1). Find the unit vector in the direction of $\vec{AB}$.

17. Convert to rectangular coordinates: $\left(3, \frac{3\pi}{4}\right)$.

18. Eliminate the parameter:
x = 3 cos t
y = 3 sin t

19. Evaluate: $|3+2i|$.

20. Write in a + bi form: $6(\cos(-30°)+i\sin(-30)°)$.

21. Write in trig form: $-1+i\sqrt{3}$.

22. Given: $z_1 = 3cis50°$, $z_2 = 6cis150°$. Find:

    a. $z_1 \cdot z_2$

    b. $\frac{z_1}{z_2}$

    c. $z_1^{\,3}$

    d. Find the cube roots of z_2

23. Identify the polar graph:

    a. $r = 3\sin 4\theta$

    b. $r = 3\sin\theta$

    c. $r = 3+\sin\theta$

    d. $r = 1+3\sin\theta$

24. Find the slope of $f(x) = x^3 - 2x - 1$ at x = 1.

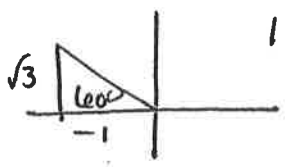
25. Find: $\lim_{x\to 3}\frac{x^2+2x-15}{3-x}$.

26. Find: $\lim_{x\to 0}\frac{\sin 5x}{x}$.

27. Find: $\int_{-2\pi}^{\frac{3\pi}{2}} |\cos x| dx$ Skip

28. Find: $\int_0^6 \sqrt{36-x^2}\,dx$ Skip

Key Precal Honors Final Exam Review

① 

$\frac{2\pi}{3}$

② $y = \tan 2x$

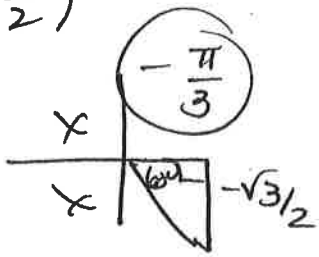
Period = $\frac{\pi}{2}$

③ $y = -2\sin(3(x - \frac{\pi}{9}))$

right $\frac{\pi}{9}$

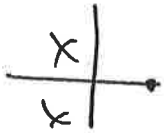
④ $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

function



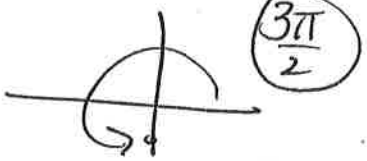
⑤ Function

$\tan^{-1}(0)$



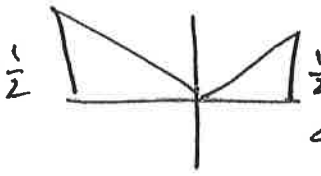
⑥ $[0, 2\pi)$

$\csc x = -1$



⑦ $[0, 2\pi)$ $\quad 0 \le x < 2\pi$

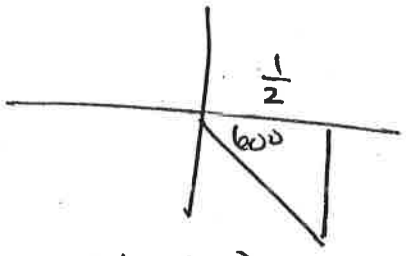
$\sin 2x = \frac{1}{2}$ $\quad 0 \le 2x < 4\pi$



$2x = \left\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{13\pi}{6}, \frac{17\pi}{6}\right\}$

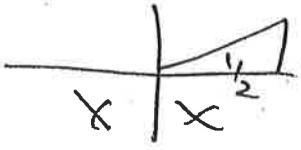
$x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}$

⑧ $\cos^{-1}(\cos\frac{\pi}{3})$

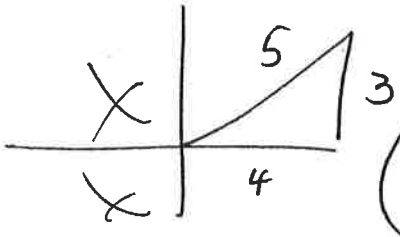


$\cos^{-1}\left(\frac{1}{2}\right)$

$\frac{\pi}{3}$



⑨ $\tan(\sin^{-1}\frac{3}{5})$



$\frac{3}{4}$

⑩

$\csc x - \cos x \cot x$

$\frac{1}{\sin x} - \cos x \cdot \frac{\cos x}{\sin x}$

$\frac{1}{\sin x}(1 - \cos^2 x)$

$\frac{\sin^2 x}{\sin x} = \sin x$

(11) $[0, 2\pi)$ $\cos 2t - \cos t = 0$

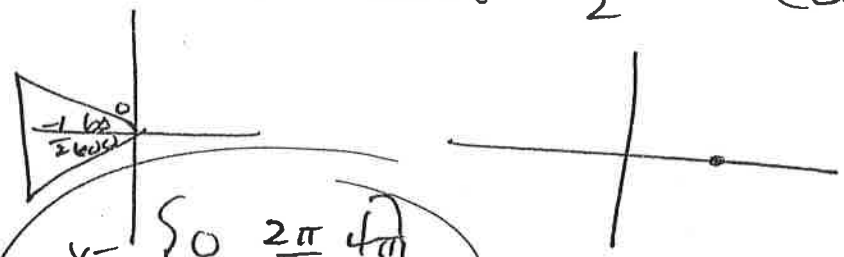
$\cos^2 t - \sin^2 t - \cos t = 0$

$\cos^2 t - (1 - \cos^2 t) - \cos t = 0$

$2\cos^2 t - \cos t - 1 = 0$

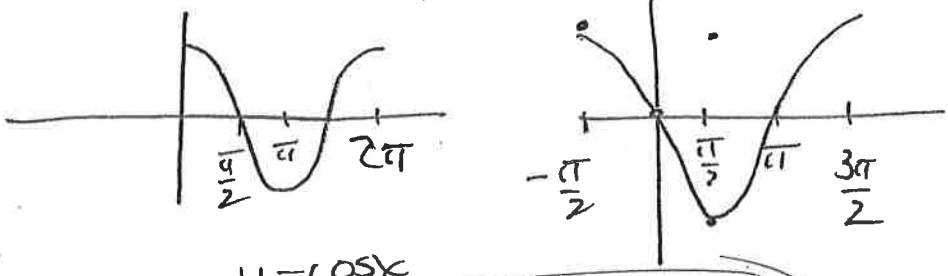
$(2\cos t + 1)(\cos t - 1) = 0$

$\cos t = -\frac{1}{2}$ $\cos t = 1$



$x = \left\{0, \frac{2\pi}{3}, \frac{4\pi}{3}\right\}$

(12) $\cos\left(x + \frac{\pi}{2}\right)$ left $\frac{\pi}{2}$



$y = \cos x$

$y = -\sin(x)$

(13) $v = \langle 4, 2 \rangle$

$w = \langle 1, -3 \rangle$

$v \cdot w = 4 \cdot 1 + 2(-3)$

-2

(14) $u = \langle 2, -1 \rangle$

$w = \langle 1, -3 \rangle$

$|w - 2u|$

$\langle 1 - 2(2), -3 + (-2)(-1) \rangle$

$\langle -3, -1 \rangle$

$\sqrt{9+1} = \sqrt{10}$

(15) $\langle 4, -9 \rangle$

(16) $\langle 1, 0 \rangle$

(17) $\left(3, \frac{3\pi}{4}\right)$ $x = r\cos\theta$ $y = r\sin\theta$

$\left(-\frac{3\sqrt{2}}{2}, \frac{3\sqrt{2}}{2}\right)$

(18) $x = 3\cos t$

$y = 3\sin t$

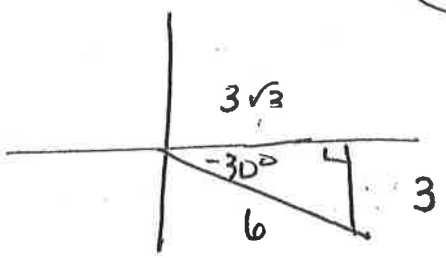
$(x-0)^2 + (y-0)^2 = 9$

(19) $|3+2i|$

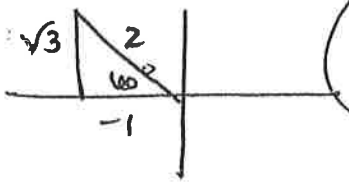
$\sqrt{9+4} = \sqrt{13}$

(20) $6\,\text{cis}\,-30°$

$3\sqrt{3} - 3i$



(21) $-1 + i\sqrt{3}$



$2\,\text{cis}\,\frac{2\pi}{3}$

(22) $z_1 = 3\,\text{cis}\,50°$

$z_2 = 6\,\text{cis}\,150°$

(22a) $z_1 \cdot z_2 = r_1 \cdot r_2\,\text{cis}(\theta_1 + \theta_2)$

$= 18\,\text{cis}\,200°$

(b) $\frac{z_1}{z_2} = \frac{r_1}{r_2}\,\text{cis}(\theta_1 - \theta_2)$

$= \frac{1}{2}\,\text{cis}(-100°)$

(c) $z_1^{\,3} = 3^3\,\text{cis}\,150°$

$z^n = r^n\,\text{cis}(n\theta)$

$= 27\,\text{cis}\,150°$

$\frac{360}{3} = 120°$

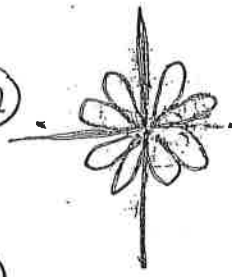
(d) $z_2^{\frac{1}{3}}$

$z_A = 6^{\frac{1}{3}}\,\text{cis}\,50°$

$z_B = 6^{\frac{1}{3}}\,\text{cis}\,170°$

$z_C = 6^{\frac{1}{3}}\,\text{cis}\,290°$

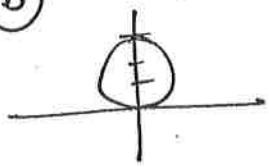
(23) (a)



$r = 3\sin 4\theta$

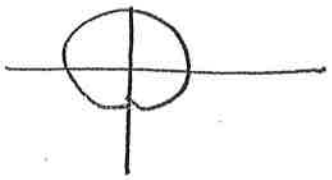
$\frac{90°}{4} = 22.5$

(b)

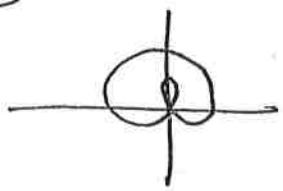


$r = 3\sin\theta$

(c) $r = 3 + \sin\theta$



(d) $r = 1 + 3\sin\theta$



(24) $f'(1) = 1$

$\lim_{h\to 0} \frac{f(1+h) - f(1)}{h}$

$\lim_{h\to 0} \frac{(1+h)^3 - 2(1+h) - 1 - (-2)}{h}$

$\lim_{h\to 0} \frac{1 + 3h + 3h^2 + h^3 - 2 - 2h - 1 + 2}{h}$

$\lim_{h\to 0} \frac{h + 4h^2 + h^3}{h} = \lim_{h\to 0} \frac{h(1 + 4h + h^2)}{h}$

$f'(1) = 1$

(25) $\lim_{x \to 3} \frac{(x+5)(3-x)}{3-x}$

$\lim_{x \to 3} \frac{-(x+5)(3-x)}{3-x}$

$\lim_{x \to 3} -(x+5)$

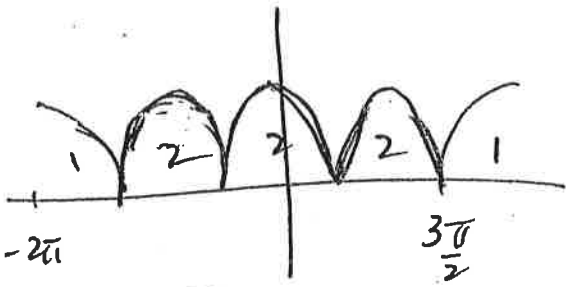
-8

(26) $\lim_{x \to 0} \frac{\sin 5x}{-x}$

$5 \lim_{x \to 0} \frac{\sin 5x}{5x}$

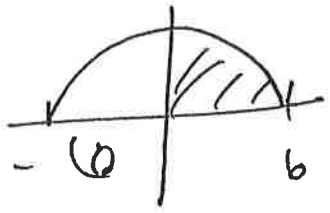
5

(27) $\int_{-2\pi}^{\frac{3\pi}{2}} |\cos x| \, dx$



7

(28) $\int_0^6 \sqrt{36 - x^2} \, dx$



$\frac{1}{4} \cdot 36\pi = 9\pi$

Name_____

Precalculus Honors Review Quiz

1) find all solutions $\sec x = -5$ Calculator

2) solve for x for $x \in [0, 2\pi)$ No Calculator

$\sin^2(2x) = \frac{1}{2}$

3) find domain and range No Calculator

$y = 2 - 3\cos^{-1}(4x)$

4) Write in parametric form. No Calculator

$y = x^2 - 3x + 5$

5) evaluate $\cos^{-1}\left(\sin\frac{5\pi}{3}\right)$ No Calculator

6) $\Delta ABC < B = 40^{\circ}, a = 5$ and $c = 8$ Calculator
Find the measure of side b.

Write C for combination or P for permutation.

1) How many different ways can Jeffrey choose 7 pokemon for battle from his collection of 100 cards?

2) There are 17 gymnasts competing for the gold, silver and bronze medals. How many different ways are there to award 3 gymnasts with a medal?

3) Five seniors apply for 3 available academic scholarships. How many different ways can the selection committee make their choice?

4) Mrs. Korbitz's class decides to hold a raffle with all proceeds donated to the local animal welfare society. If 100 tickets were sold how many ways can the five identical prizes be awarded?

5) Mrs. Korbitz's class decides to hold a raffle with all proceeds donated to the local animal welfare society. If 100 tickets were sold how many ways can the three prizes of a new car, $1,000 and a free yogurt be awarded?

6) There are 500 passengers aboard the SS Titanic II and only 100 life jackets. How many different ways can the jackets be distributed?

7) The answers to a 4 question multiple choice test are A, B, C and D (not necessarily in that order). How many different ways can the teacher make an answer key?

8) How many different 5 card poker hands have all red cards?

9) Three students try out for the play. The parts available are Anna, Elsa and Olaf. How many different ways can the director assign parts?

10) The nine supreme court justices always shake hands before they begin every session. How many handshakes are necessary?

Write combination or permutation for each.

1) How many ways can 10 people enter a room and greet each other by shaking hands?

2) There are 6 bagels on the tray: cinnamon, raisin, plain, onion, cheese and blueberry. How many ways can Mrs. Korbitz choose 2 bagels for breakfast?

3) Six students want a front seat in class. How many ways can Mrs. Korbitz accommodate them if there are 6 front seats available?

4) Mrs. Korbitz will choose three winners from the student raffle. The prizes will be $100 each. How many ways can she award the prizes?

5) Mrs. Korbitz will choose three winners from the student raffle. The prizes will be $100, a trip to Hawaii and a free haircut. How many ways can she award the prizes?

6) How many different license plates have the four letters MATH ?

7) How many different ways can Mrs. Korbitz pick 3 star students from our class of 30 students?

8) How many different ways can a three digit security pin number with no repeating digits be chosen?

9) John is dealt a five card hand from a 52 card deck. How many different ways can he have all hearts?

10) There are two driver's education cars at Hinsdale Central High School. A Dodge minivan and a Mercedes convertible. How many different ways can Jackson and Connor be assigned to a car?

11) Three senior scholarships of $1,000,000 will be awarded to three lucky recipients. How many different ways can the prize money be awarded if 15 seniors applied for the scholarship?

12) The last two questions of the test will be multiple choice with possible answers A, B, C or D. How many different ways can the questions be answered if these two answers do not repeat?

13) There are 30 students in the class room and Mrs. Korbitz will check 12 student's homework. How many different ways can homework be checked?

14) Four students are chosen to play the parts of Dorothy, Scarecrow, Lion and Tin Man in the school play. How many ways can the actors be chosen for the parts?

15) There are 5 people on board the SS Minnow and 4 life jackets. How many different ways can the life jackets be distributed if all of the jackets are the same?

16) There are 5 people on board the SS Minnow and 4 life jackets. How many different ways can the life jackets be distributed if one jacket is ripped, another jacket is for an infant, another jacket smells bad and the last jacket comes with a built in snack bar?

17) Twenty people try out for nine spots on American Idol. How many different ways can 9 spots be filled?

18) How many different ways can Mrs. Korbitz line up her 4 pet rocks on a shelf?