AP Calculus AB Name____________________________

So You Want More Practice, eh?

1) Show that the function *f* satisfies the hypotheses of the Mean Value Theorem on the given interval. Find each value of *c* that satisfies the Mean Value Theorem.

If numbers are "bad"

$f(x) = 3x^2 + x - 5$, [-1, 4]

f is continuous on [-1, 4] and differentiable on -1, 4).

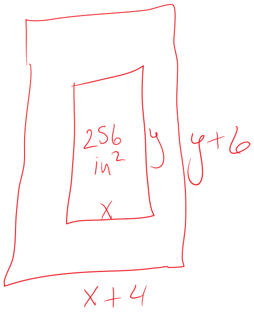
$\frac{f(4)-f(-1)}{4--1} = \frac{47--3}{5} = 10$

$6x+1=10$

$6x=9$

$x = \frac{9}{6} = \boxed{3/2}$

2) You are designing a rectangular poster to contain 256 in^2 of printing with a 3-in margin at the top and bottom and a 2-in margin at each side. What overall dimensions will minimize the amount of paper used? Round your answer to the nearest $\frac{1}{4}$ inch.



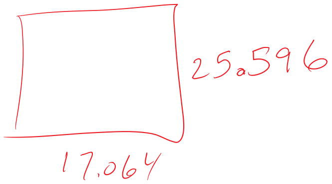
$A=(x+4)(y+6)$

$A=(x+4)(\frac{256}{x}+6)$

min dimensions are 17 in X 25.5 in b/c when x= 13.064 A' changes from neg to pos

$xy=256$

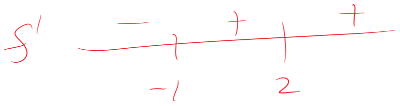
$y=\frac{256}{x}$



3) If $f'(x) = (x+1)(x-2)^2$, then find the value of x at each point where f has a:

a) local maximum

None



b) local minimum

x=-1

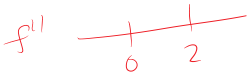
c) point of inflection

$f''(x) = 1(x-2)^2 + 2(x-2)^1\cdot(x+1)$

$=(x-2)[(x-2)+2(x+1)]$

$=(x-2)(3x)$

$\boxed{x=2, \quad x=0}$



4) If the point (1, 6) is a point of inflection of the curve $y = x^3 + ax^2 + bx + 1$, find the values of a and b.

$y' = 3x^2 + 2ax + b$

$y'' = 6x + 2a$

$x = 1$

$y'' = 0$

$0 = 6(1) + 2a$

$-6 = 2a$

$a = -3$

$y = x^3 - 3x^2 + bx + 1$

$6 = 1^3 - 3(1)^2 + b(1) + 1$

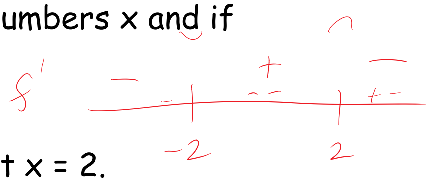
$6 = 1 - 3 + b + 1$

$6 = -1 + b$

$7 = b$

$$\boxed{\begin{array}{l} a = -3 \\ b = 7 \end{array}}$$

5) If g is a differentiable function such that g(x) < 0 for all real numbers x and if $f'(x) = (x^2 - 4)g(x)$, which of the following is true.



(a) f has a relative maximum at x = -2 and a relative minimum at x = 2.
[✓ (b)] f has a relative minimum at x = -2 and a relative maximum at x = 2.
(c) f has relative minima at x = -2 and x = 2.
(d) f has relative maxima at x = -2 and x = 2.
(e) It cannot be determined if f has any relative extrema.

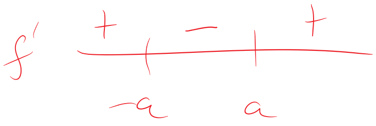
6) Let $f(x) = x^3 - 3a^2x + 2a^3$ where a is a positive constant.

$f'(x) = 3x^2 - 3a^2$

$3(x^2 - a^2) = 0$

$3(x+a)(x-a) = 0$

$x = -a, \ x = a$



a) Find the intervals where f(x) is decreasing.

$[-a, a]$ b/c $f' < 0$

b) Find the relative maximum value of the function.

$f(-a) = (-a)^3 - 3a^2(-a) + 2a^3$

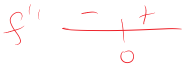
$= -a^3 + 3a^3 + 2a^3$

$= 4a^3$

$$\boxed{4a^3}$$

c) Find the point of inflection.

$f''(x) = 6x$



$x = 0$

$$\boxed{(0, 2a^3)}$$