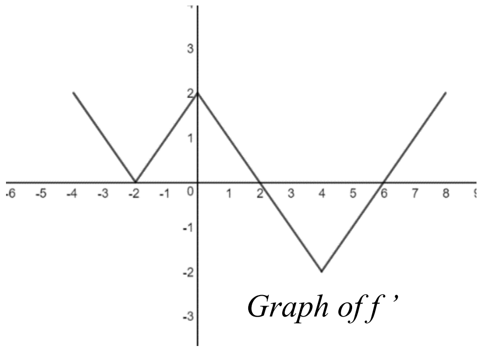
AP Calculus AB **Name:**
AP Review #4

1.



a. Let $g(x) = f(3x)$. Calculate $g'(-1)$.

$g'(x) = f'(3x) \cdot 3$ $g'(-1) = f'(-3) \cdot 3 = 1 \cdot 3 = 3$

b. Let $h(x) = \int_{-10}^{\frac{x}{2}} f'(x)\,dx$. Calculate $h'(8)$.

$h'(x) = f'\left(\frac{x}{2}\right) \cdot \frac{1}{2}$ $h'(8) = f'(4) \cdot \frac{1}{2} = -2 \cdot \frac{1}{2} = -1$

c. Let $m(x) = x^2 f'\left(\frac{x}{2}\right)$. Calculate $m'(2)$.

$m'(x) = x^2 \cdot f''\left(\frac{x}{2}\right) \cdot \frac{1}{2} + f'\left(\frac{x}{2}\right) \cdot 2x$ $m'(2) = 4 \cdot -1 \cdot \frac{1}{2} + 1 \cdot 2 \cdot 2$
$= 2$

2. Given the graph of f', write an expression for $f(x)$ if $f(3) = 11$.

$\int_3^x f'(t)\,dt = f(x) - f(3)$

$f(x) = 11 + \int_3^x f'(t)\,dt$

3. Given the graph of f', write an expression for $f(x)$ if $f(-2) = -5$.

$\int_{-2}^x f'(t)\,dt = f(x) - f(-2)$

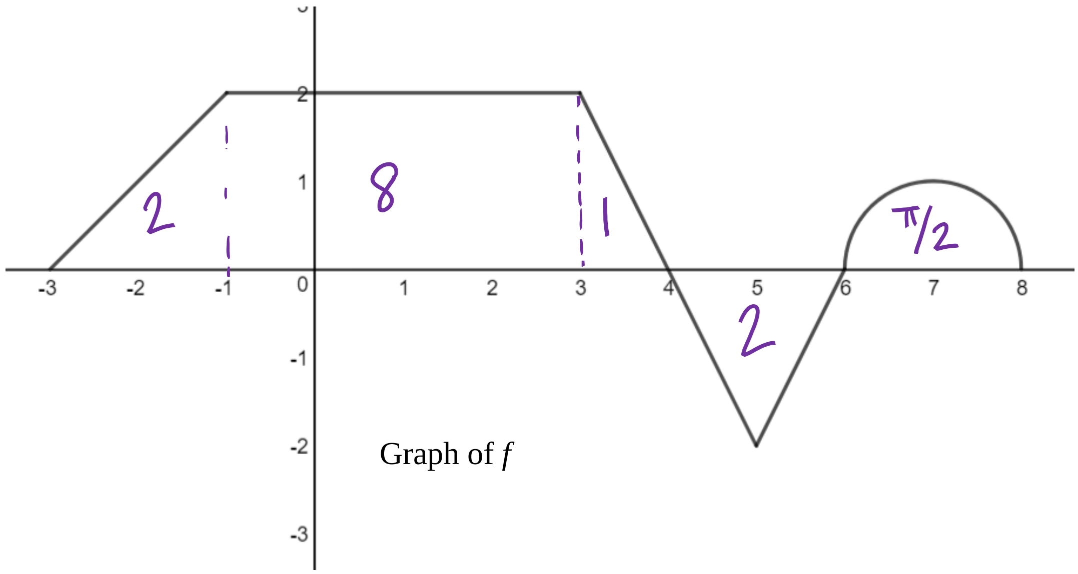
$f(x) = -5 + \int_{-2}^x f'(t)\,dt$

4. Let $g(x)$ be the antiderivative of $f(x)$. If $g(17) = 2.301$, write an expression for $g(x)$.

$\int_{17}^x f(t)\,dt = g(x) - g(17)$

$g(x) = 2.301 + \int_{17}^x f(t)\,dt$

5. Let g be the antiderivative of f and let $g(6)=5$. f is piecewise defined with line segments and a semicircle.



a. For what interval(s) is g increasing? Justify your answer.

$[-3,4] \cup [6,8]$ because $g' = f > 0$

b. For what interval(s) is g concave down? Justify your answer.

$(3,5) \cup (7,8)$ because $g'' = f' < 0$

c. Write an expression for $g(x)$.

$$g(x) = 5 + \int_6^x f(t)\,dt$$

d. Find $g(-3)$.

$$g(-3) = 5 + \int_6^{-3} f(t)\,dt = 5 - 9 = -4$$

e. Find $g(3)$.

$$g(3) = 5 + \int_6^3 f(t)\,dt = 5 + 1 = 6$$

f. Find $g(8)$.

$$g(8) = 5 + \int_6^8 f(t)\,dt = 5 + \frac{\pi}{2}$$

g. Find the absolute maximum value of g. Justify your answer.

x	$g(x)$
-3	-4
4	7
8	$5+\pi/2$

$$g(4) = 5 + \int_6^4 f(t)\,dt = 5 + 2 = 7$$

The max value is 7 at $x=4$ because $g' = f$ changes from + to −.