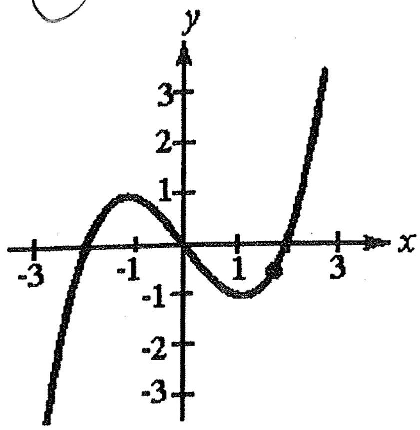
Key

1. Determine whether the slope at the indicated point is positive, negative, or zero.
   a. None of these
   b. Zero
   c. No slope
   d. Negative
   e. Positive



2. If $f(x) = 2x^2 + 4$, which of the following will calculate the derivative of $f(x)$?

   a. $$\lim_{\Delta x \to 0} \frac{[2(x + \Delta x)^2 + 4] - (2x2 + 4)}{\Delta x}$$

   b. $$\frac{[2(x + \Delta x)^2 + 4] - (2x^2 + 4)}{\Delta x}$$

   c. $$\lim_{\Delta x \to 0} \frac{(2x^2 + 4 + \Delta x) - (2x^2 + 4)}{\Delta x}$$

   d. $$\frac{(2x^2 + 4 + \Delta x) - (2x^2 + 4)}{\Delta x}$$

   e. None of these

3. Find an equation of the tangent line to the graph of $f(x) = x^2 - 2x - 3$ at the point $(-2, 5)$.

$f'(x) = 2x - 2$
$f'(x) = 2(-2) - 2$
$= -4 - 2 = -6$
$\boxed{y - 5 = -6(x+2)}$
or
$\boxed{y = -6x - 7}$

4. Find $f'(x)$: $f(x) = 4x^4 - 5x^3 + 2x - 3$.
   a. $16x^3 - 15x^2 + 2$
   b. None of these
   c. $16x^3 - 15x^2 + 2x - 3$
   d. $4x^4 - 5x^3 + 2x$
   e. $4x^3 - 5x^2 + 2$

$16x^3 - 15x^2 + 2$

$f(x) = x^{-2}$ $f'(x) = -2x^{-3}$ $= \boxed{\dfrac{-2}{x^3}}$

5. Find $f'(x)$: $f(x) = \dfrac{1}{x^2}$.

   a. $\dfrac{2}{x}$

   b. None of these

   c. $\dfrac{1}{x}$

   d. $-\dfrac{1}{x^3}$

   e. $-\dfrac{2}{x^3}$

P. 117
Constant Multiple Rule

Ex | $f(x)$ $y = 2x^2$ $y' = 4x$ $y'(-6) = 4(-6) = -24$ | $g(x)$ $y = 18x^2$ $y' = 36x$ $y'(-6) = -216$

$\dfrac{-216}{-24} = 9$

6. Let $g(x) = 9f(x)$ and let $f'(-6) = -6$. Find $g'(-6)$.
   a. -6
   b. 9
   c. -54
   d. None of these
   e. 0

7. Find the $\boxed{\text{instantaneous rate}}$ of change of w with respect to z for $w = \dfrac{1}{z} + \dfrac{z}{2}$.

   w'

   $w = z^{-1} + \frac{1}{2}z$

   $= -z^{-2} + \frac{1}{2} = \dfrac{-1}{z^2} + \dfrac{1}{2}$

   $= \dfrac{-2 + z^2}{2z^2}$

   a. $\dfrac{z^2 - 2}{2z^2}$

   b. $\dfrac{3}{2}$

   c. None of these

   d. -2

   e. $\dfrac{-1}{z^2}$

8. Find an equation for the tangent line to the graph of $f(x) = -2x^2 + 2x + 3$ at the point where $x = 1$.
   a. $y = -4x + 2$
   b. $y = -4x^2 + 2x + 1$
   c. None of these
   d. $2x + y - 1 = 0$
   e. $2x + y = 5$

$f'(x) = -4x + 2$
$f'(1) = -4(1) + 2$
$= -2$

$f(1) = -2(1)^2 + 2(1) + 3$
$= -2 + 2 + 3$
$= 3$

$y - 3 = -2(x - 1)$
$y = -2x + 5$
$2x + y = 5$

9. Find the point(s) on the graph of the function $f(x) = x^3 - 2$ where the slope is 3.

a. (1, 3), (-1, 3)
b. (1, -1), (-1, -3)
c. $(\sqrt[3]{2}, 0)$
d. (1, 3)
e. None of these

$f'(x) = 3x^2$
$3x^2 = 3$
$x^2 = 1$
$x = \pm 1$

(1, -1)
(-1, -3)

10. Suppose the position equation for a moving object is given by $s(t) = 3t^2 + 2t + 5$ where s is measured in meters and t is measured in seconds. Find the velocity of the object when $t = 2$.

a. 10 m/sec
b. 6 m/sec
c. None of these
d. 14 m/sec
e. 13 m/sec

$s'(t) = v(t) = 6t + 2$
$v(2) = 6(2) + 2 = 14$

$\Delta y / \Delta x$

11. Find the average rate of change of y with respect to x on the interval $[0, 5]$, where $y = 2x^2 + x - 3$.

$m = 11$

$\frac{f(5) - f(0)}{5 - 0} = \frac{52 - -3}{5} = \frac{55}{5} = 11$

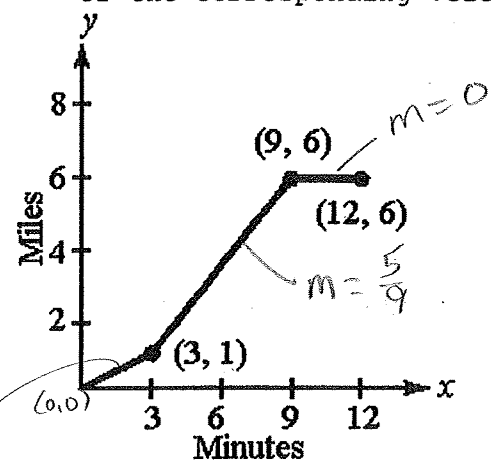
$f(5) = 2(5)^2 + 5 - 3 = 52$
$f(0) = 2(0)^2 + 0 - 3 = -3$

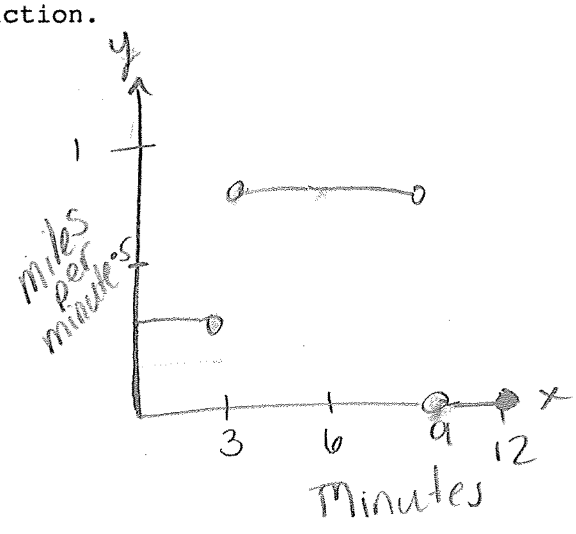
12. Find $\frac{dy}{dx}$: $y = 4 \sin x - 5 \cos x + x$.

$4 \cos x + 5 \sin x + 1$

a. $4 \cos x + 5 \sin x$
b. $-4 \cos x + 5 \sin x + 1$
c. None of these
d. $4 \cos x + 5 \sin x + 1$
e. $4 \cos x - 5 \sin x + 1$

13. The given graph of a position function represents the distance in miles that a person drives during a 12-minute drive to school. Make a sketch of the corresponding velocity function.





$m = \frac{1-0}{3-0} = \frac{1}{3}$

14. Differentiate: $y = \dfrac{3x}{x^2 + 1}$.

a. $\dfrac{3(1 - x^2)}{(1 + x^2)^2}$

b. $\dfrac{3}{2x}$

c. None of these

d. $\dfrac{3x^2 - 3}{(1 + x^2)^3}$

e. $\dfrac{3}{1 + x^2}$

$$y' = \frac{(x^2+1)\cdot 3 - 3x(2x)}{(x^2+1)^2}$$

$$= \frac{3x^2+3-6x^2}{(x^2+1)^2} = \frac{-3x^2+3}{(x^2+1)^2}$$

$-3(x^2-1)$

15. Let $f(7) = 0$, $f'(7) = 14$, $g(7) = 1$ and $g'(7) = \dfrac{1}{7}$. Find $h'(7)$ if $h(x) = f(x)/g(x)$.

Quotient Rule

a. -2
b. 14
c. -14
d. 98
e. None of these

$$h'(x) = \frac{g(x)\cdot f'(x) - f(x)\cdot g'(x)}{(g(x))^2}$$

$$= h'(7) = \frac{1\cdot 14 - 0\cdot \frac{1}{7}}{1^2}$$

$= 14$

16. If $f''(x) = -2x^2 + 7x - 2$, find $f^{(4)}(x)$.

a. $-4x + 7$
b. -4
c. $-2x + 7$
d. None of these
e. 0

$f''' = -4x + 7$

$f^4 = -4$