Key

Math 4

Name _____

5-5 Practice 2

Date _____

Notations: In addition to $f'(x)$, various notations are used to denote the derivative of $y = f(x)$. The ones most commonly used are y' and $\frac{dy}{dx}$. $\frac{dy}{dx}$ should be thought of as the derivative of y with respect to the variable x.

Problems:

1. $f(x) = 4x^3 - 8x^2 + 2x$ find $f'(x)$. $f'(x) = 12x^2 - 16x + 2$

2. $g(x) = -2x^2 - 3x + 1$ find $g'(x)$. $g'(x) = -4x - 3$

3. $f(x) = 3x^2 - 8x + 5x^{-1}$ find $f'(x)$. $f'(x) = 6x - 8 - 5x^{-2}$

4. $y = 6x^4 - 3x^3 + 8$ find y'. $y' = 24x^3 - 9x^2$

5. $y = 2x + 1$ find $\frac{dy}{dx}$. $\frac{dy}{dx} = 2$

6. $y = x^2$ find $\frac{dy}{dx}$. $\frac{dy}{dx} = 2x$

7. $s = -16t^2 + 96t$ find $\frac{ds}{dt}$. $\frac{ds}{dt} = -32t + 96$

8. $v = -32t + 96$ find $\frac{dv}{dt}$. $\frac{dv}{dt} = -32$

9. $y = 4 - 8z + 2z^3$ find $\frac{dy}{dz}$. $\frac{dy}{dz} = -8 + 6z^2$ No 2 needed here

10. $y = \sqrt{x^5} = x^{\frac{5}{2}}$ find y'. $y' = \frac{5}{2}x^{\frac{3}{2}} = \frac{5}{2}\sqrt{x^3}$

(Write your final answer in radical form.)

11. $y = 6x^5 - \frac{3}{x^3} + \frac{8}{x^5}$ find $\frac{dy}{dx}$. $\frac{dy}{dx} = 30x^4 + 9x^{-4} - 40x^{-6}$

$6x^5 - 3x^{-3} + 8x^{-5}$

12. $y = .01x^4 + .01x^3 - .46x^2 - .04x + 1.68$ find y'. $y' = 0.04x^3 + 0.03x^2 - 0.92x - 0.04$

$y = x^{5/3} - x^{3/5}$

13. $y = \sqrt[3]{x^5} - \sqrt[5]{x^3}$ find $\frac{dy}{dx}$. $\frac{dy}{dx} = \frac{5}{3}x^{\frac{2}{3}} - \frac{3}{5}x^{-2/5} = \frac{5}{3}\sqrt[3]{x^2} - \frac{3}{5}\sqrt[5]{x^{-2}}$

(Write your final answer in radical form.)

14. $g(x) = 16 - 4x^{-2} + \frac{3}{4}x^{-4} - 5x^{-5}$ find $g'(x)$. $g'(x) = 8x^{-3} - 3x^{-5} + 25x^{-6}$

15. A particle moves along the x-axis in such a way that its position at time t is given by $s(t) = 3t^4 - 16t^3 + 24t^2$ for $-5 \le t < 5$.

a. Show that at time $t = 0$ the particle is moving to the right.

b. Find all values of t for which the particle is moving to the left.

c. What is the position of the particle at time $t = 3$?

d. When $t = -1$ to $t = 3$, what is the total distance the particle has traveled?

a) $v(t) = 12t^3 - 48t^2 + 48t$

$v(1) = 12$ → Moving right

b) $v(t) = 12t(t^2 - 4t + 4)$

$= 12t(t-2)(t-2)$

	-5	0	2	5
$12t$	$-$	$+$	$+$	
$t-2$	$-$	$-$	$+$	
$t-2$	$-$	$-$	$+$	
	$\ominus$	$\oplus$	$\oplus$	

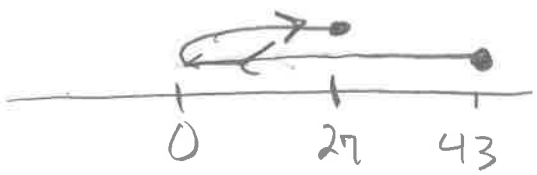
$-5 \le t < 0$

c) $s(3) = 27$

d) Start: $s(-1) = 43$

End: $s(3) = 27$

Change direction: $s(0) = 0$



$d = 43 + 27 = 70$ units

d ↓ distance

16. A particle moves along the x-axis in such a way that its position at time t is given by $s(t) = \frac{1}{3}t^3 - 3t^2 + 8t$, $t > 0$

a. Determine the velocity and acceleration of the particle at time t. [find $v(t)$ and $a(t)$]

b. For what values of t is the particle at rest?

c. For what values of t does the particle change direction?

d. What is the velocity when the acceleration is first zero?

a) $v(t) = t^2 - 6t + 8$

$a(t) = 2t - 6$

b) $v(t) = 0$

$0 = (t-4)(t-2)$

$t = 4, t = 2$ sec

c)

	0	2	4	
$t-4$	$-$	$-$	$+$	
$t-2$	$-$	$+$	$+$	
	$\oplus$	$\ominus$	$\oplus$	
	Right	Left	Right	

Changes direction at $t = 2$, $t = 4$

d) $a(t) = 0$

$0 = 2t - 6$

$t = 3$

$v(3) = (3)^2 - 6(3) + 8$

$= -1$ → Moving left