Math 4 Name

5-4 **Practice** Date

For Numbers 1 & 2, write the expressions in the form ax^n

1. $\frac{2}{x^3} = \boxed{2x^{-3}}$ 2. $\sqrt[4]{x} = \boxed{x^{\frac{1}{4}}}$

3. Find the following difference: $-3-1 = \boxed{-4}$

Use the Power Rule to find the following derivatives:

***Notation: In addition to $f'(x)$, various notations are used to denote the derivative of *f(x)*.

The ones most commonly used are y' and $\frac{dy}{dx}$. The notation of $\frac{dy}{dx}$ should be thought of as the "derivative of *y* with respect to the variable *x*.", and it means the same as $f'(x)$.

4. $f(x) = 3x^2 - 2x + 5$ $f'(x) = 6x - 2$

5. $f(x) = 3x^4 - 2x^3 + 5x$ $f'(x) = 12x^3 - 6x^2 + 5$

6. $y = x^6 + 4x^3 + 2x^2$ $\frac{dy}{dx} = 6x^5 + 12x^2 + 4x$

7. $y = 4x^{-3}$ $\frac{dy}{dx} = -12x^{-4} = \boxed{\frac{-12}{x^4}}$

8. $f(x) = \frac{3}{x^4} = 3x^{-4}$ $f'(x) = -12x^{-5} = \boxed{\frac{-12}{x^5}}$

9. $f(x) = \sqrt{x} = x^{\frac{1}{2}}$ $f'(x) = \frac{1}{2}x^{-\frac{1}{2}} = \frac{1}{2}\cdot\frac{1}{\sqrt{x}} = \boxed{\frac{1}{2\sqrt{x}}}$

10. At the right is a graph of $f'(x)$.

a. On what interval is the graph of $f(x)$ increasing? Explain how you know.

$-2 < x < 4$. f' is positive

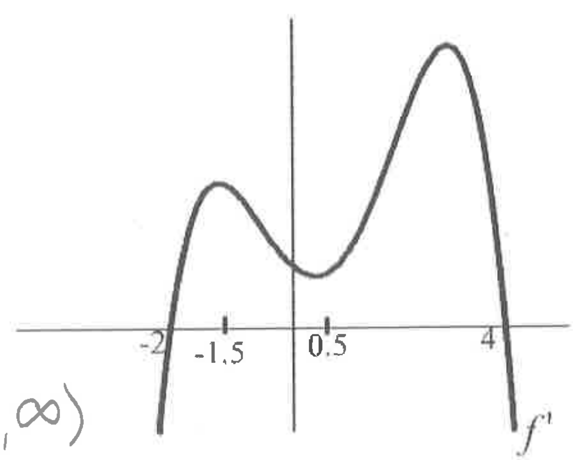
or

$(-2, 4)$

b. On what interval is the graph of $f(x)$ decreasing? Explain how you know.

$x < -2$ & $x > 4$ or $(-\infty, -2) \cup (4, \infty)$

f' is negative

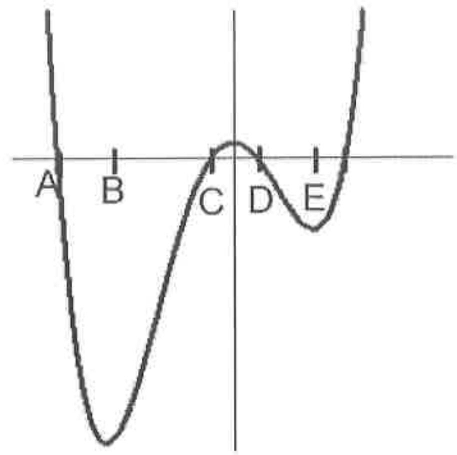


11. At the right is a graph of $f(x)$. What do you know about the graph of $f'(x)$, the derivative function? There should be at least three specific details you can mention.

f' is negative: $(-\infty, B) \cup (0, E)$

positive: $(B, 0) \cup (E, \infty)$

zero: $x = B$, $x = 0$ + $x = E$



12. A particle moves so that the distance s traveled in meters at time t seconds is given by $s(t) = t^2 + 5t - 4$

a. Find the instantaneous velocity of the particle at time $t = 8$.

$s'(t) = 2t + 5$ $\quad s'(8) = 2(8) + 5 = \boxed{21 \text{ m/s}}$

b. What is the initial velocity of the particle?

$s'(0) = 2(0) + 5 = \boxed{5 \text{ m/s}}$

13. A certain flashlight is pointed directly at a wall. The area A in square inches of the illuminated area is $A(d) = \pi d^2 + 2\pi d + \pi$, where d is the flashlight's distance (in inches) from the wall.

a. Find the illuminated area at $d = 3$ inches

$A(3) = \pi(3)^2 + 2\pi(3) + \pi = 9\pi + 6\pi + \pi = \boxed{16\pi \text{ in}^2}$

b. Find the derivative of $A(d)$.

$A'(d) = 2\pi d + 2\pi$

c. Find the instantaneous rate of change of the illuminated area when $d = 3$ inches.

$A'(3) = 2\pi(3) + 2\pi = 6\pi + 2\pi = 8\pi$ square inches/in.

d. What does your answer to part (c) mean in the context of this problem?

When the light is three inches from the wall, the rate of change of the light's area is 8π square inches of illuminated area per inch of distance from the wall.