Practice Problems in using the definition of derivatives.

a. Given $f(x) = 10$ Find $f'(3)$ by using $\lim_{h\to 0}\frac{f(3+h)-f(3)}{h}$ Answer: $f'(3) = 0$

b. Given $f(x) = -4x$ Find $f'(3)$ by using $\lim_{h\to 0}\frac{f(3+h)-f(3)}{h}$ Answer: $f'(3) = -4$

c. Given $f(x) = -4x + 10$ Find $f'(3)$ by using $\lim_{h\to 0}\frac{f(3+h)-f(3)}{h}$ Answer: $f'(3) = -4$

d. Given $f(x) = x^2$ Find $f'(3)$ by using $\lim_{h\to 0}\frac{f(3+h)-f(3)}{h}$ Answer: $f'(3) = 6$

e. Given $f(x) = x^2 - 4x + 10$ Find $f'(3)$ by using $\lim_{h\to 0}\frac{f(3+h)-f(3)}{h}$ Answer: $f'(3) = 2$

f. Given $f(x) = 3x^2 - 5x + 2$ Find $f'(1)$ by using $\lim_{h\to 0}\frac{f(1+h)-f(1)}{h}$ Answer: $f'(1) = 1$

Practice Problems in using the definition of derivatives.

g. Given $f(x) = 10$ Find $f'(x)$ by using $\lim_{h\to 0}\frac{f(x+h)-f(h)}{h}$ Answer: $f'(x) = 0$

h. Given $f(x) = -4x$ Find $f'(x)$ by using $\lim_{h\to 0}\frac{f(x+h)-f(h)}{h}$ Answer: $f'(x) = -4$

i. Given $f(x) = -4x + 10$ Find $f'(x)$ by using $\lim_{h\to 0}\frac{f(x+h)-f(h)}{h}$ Answer: $f'(3) = -4$

j. Given $f(x) = x^2$ Find $f'(x)$ by using $\lim_{h\to 0}\frac{f(x+h)-f(h)}{h}$ Answer: $f'(x) = 2x$

k. Given $f(x) = x^2 - 4x + 10$ Find $f'(x)$ by using $\lim_{h\to 0}\frac{f(x+h)-f(h)}{h}$ Answer: $f'(x) = 2x - 4$

l. Given $f(x) = 3x^2 - 5x + 2$ Find $f'(x)$ by using $\lim_{h\to 0}\frac{f(x+h)-f(h)}{h}$ Answer: $f'(x) = 6x - 5$

2.2 Worksheet #2 - More Power Rule Practice

Compute the derivatives of the following functions.

(1) $f(x) = x^2 - 2$

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

(3) $f(x) = x^2 + 3x - 6$

(4) $f(x) = 2x^2 - 4$

(5) $f(x) = \frac{2}{x}$

(6) $f(x) = \frac{4}{x^2} - \frac{x^2}{4}$

(7) $f(x) = 2x^{10} - 4x^2$

(8) $f(x) = 3\sqrt{x}$

(9) $f(x) = x\sqrt{3}$

(10) $f(x) = \frac{x^4}{4} + x - 2$

(11) $f(x) = x(x+1)$

(12) $f(x) = x^2 - e^2$

(13) $f(x) = 5x^3 - \frac{5}{x^3}$

(14) $f(x) = (6x+5) - (3x+x^2)$

(15) $f(x) = 2x^2 - 5x + 10$

(16) $f(x) = x - \frac{1}{x}$

(17) $f(x) = 4x^{\frac{5}{2}}$

(18) $f(x) = 1 - 5$

(19) $f(x) = \frac{1}{3x}$

(20) $f(x) = \frac{x^2}{2} - 3x$

(21) $f(x) = 5^2$

(22) $f(x) = (x^2+1)^2$

(23) $f(x) = x^{1000}$

(24) $f(x) = \frac{1}{x^{1000}}$

(25) $f(x) = \frac{x^2}{\ln(2)}$

(26) $f(x) = \sqrt{3x}$

(27) $f(x) = \sqrt{7}$

(28) $f(x) = \frac{x^2-1}{x}$

(29) $f(x) = \frac{8}{\sqrt{x}} - 3x$

(30) $f(x) = \frac{7x+3x^2}{5\sqrt{x}}$

Answers

$(1) 2x$	$(2) 1-3x^2$	$(3) 2x+3$
$(4) 4x$	$(5) -2x^{-2}$	$(6) -8x^{-3}-\frac{x}{2}$
$(7) 20x^9-8x$	$(8) \frac{3}{2}x^{-\frac{1}{2}}$	$(9) \sqrt{3}$
$(10) x^3+1$	$(11) 2x+1$	$(12) 2x$
$(13) 15x^2+15x^{-4}$	$(14) 3-2x$	$(15) 4x-5$
$(16) 1+x^{-2}$	$(17) 10x^{\frac{3}{2}}$	$(18) 0$
$(19) -\frac{1}{3}x^{-2}$	$(20) x-3$	$(21) 0$
$(22) 4x^3+4x$	$(23) 1000x^{999}$	$(24) -1000x^{-1001}$
$(25) \frac{2x}{\ln(2)}$	$(26) \frac{\sqrt{3}}{2\sqrt{x}}$	$(27) 0$
$(28) 1+x^{-2}$	$(29) -4x^{-\frac{3}{2}}-3$	$(30) \frac{7}{10}x^{-\frac{1}{2}}+\frac{9}{10}x^{\frac{1}{2}}$

Power Rule Worksheet Name _____ Date _____

Find the derivative of each function.

1. $y = x^8$ 2. $y = \sqrt[3]{x}$ 3. $y = x^{\frac{-2}{5}}$ 4. $v(r) = \frac{4}{3}\pi r^3$ 5. $y(t) = 6t^{-9}$

6. $f(x) = x^2 - 10x + 100$ 7. $g(x) = x^{100} + 50x + 1$ 8. $f(x) = (2x)^3$ 9. $g(x) = x^2 + \frac{1}{x^2}$

10. $s(t) = t^8 + 6t^7 - 18t^2 + 2t$ 11. $y = \frac{x^2 + 4x + 3}{x}$ 12. $f(x) = x - 3x^{\frac{1}{3}}$

13. $y = \frac{3}{4x^3} + \frac{7}{2x^9}$ 14. $y = 5x^{-4} - \frac{7}{8}x^{-2} + 3x^2 - 6$ 15. $y = \frac{x^{12} - 2x^9 + 5x^{-7}}{4}$

16. Find an equation of the tangent line to the given curve at the specified point.

$y = x + \sqrt{x}$ at x = 1

17. Find the points on the curve $y = x^3 - x^2 - x + 1$ where the tangent is horizontal.

(Hint: what is the slope of any horizontal line)

ANSWER

1. $y' = 8x^7$ 2. $y' = \frac{1}{3}\frac{1}{\sqrt[3]{x^2}}$ 3. $y' = -\frac{2}{5}x^{\frac{-7}{5}}$ 4. $v'(r) = 4\pi r^2$ 5. $y(t) = 54t^{-10}$

6. $f'(x) = 2x - 10$ 7. $g'(x) = 100x^{99} + 50$ 8. $f(x) = 24x^2$ 9. $g'(x) = 2x^2 + -\frac{2}{x^3}$

10. $s'(t) = 8t^7 + 42t^6 - 36t + 2$ 11. $y' = 1 - \frac{3}{x^2}$ 12. $f'(x) = 1 - x^{-\frac{2}{3}}$

13. $y' = \frac{9}{4x^4} + \frac{63}{2x^{10}}$ 14. $y' = -20x^{-5} + \frac{7}{4}x^{-3} + 6x$ 15. $y' = 3x^{11} - \frac{9}{2}x^8 - \frac{35}{4}x^{-8}$

16. Find an equation of the tangent line to the given curve at the specified point.

$x = 1 \quad y = 1 + \sqrt{1} = 2 \qquad m = y' = 1 + \frac{1}{2\sqrt{x}} \quad at \quad x = 1 \quad m = y' = 1 + \frac{1}{2\sqrt{1}} = \frac{3}{2}$ at x = 1

$y - y_1 = m(x - x_1) \qquad y - 2 = \frac{3}{2}(x - 1) \qquad y = \frac{3}{2}x + \frac{1}{2}$

17. Find the points on the curve $y = x^3 - x^2 - x + 1$ where the tangent is horizontal.

(Hint: what is the slope of any horizontal line)

$m = y' = 3x^2 - 2x - 1 = 0 \qquad 3x^2 - 2x - 1 = (3x + 1)(x - 1) = 0 \qquad x = -\frac{1}{3},\ x = 1$