Calculus   Name_____

Basic Differentiation Rules   Date_____ Period_____

Differentiate each function with respect to the given variable.

1) $g(x) = -5$

$g'(x) = 0$

2) $g = -\dfrac{3}{2}x^7$

$g' = -\dfrac{21}{2}x^6$

3) $g = -5 - \dfrac{1}{10s^2}$

$g' = \dfrac{1}{5}s^{-3}$

4) $y = -\dfrac{10}{3r^8} + \dfrac{7}{3r^{10}}$

$y' = \dfrac{80}{3}r^{-9} - \dfrac{70}{3}r^{-11}$

5) $g(s) = -\dfrac{3}{4}\sqrt[8]{s} + \dfrac{4}{s^2} - \dfrac{4}{7s^5}$

$g'(s) = \dfrac{-3}{32}s^{-7/8} - 8s^{-3} + \dfrac{20}{7}s^{-6}$

6) $f = -\dfrac{3}{8}t$

$f' = -3/8$

7) $f = -\dfrac{3}{2x^6}$

$f' = 9x^{-7}$

8) $r = -\dfrac{7}{2}x^{\frac{7}{8}} - \dfrac{4}{5} + 4x^{-7}$

$r' = \dfrac{49}{16}x^{-1/8} - 28x^{-8}$

-1-

9) $f(x) = \sqrt[7]{x^3} - 4\sqrt[10]{x^3}$

$$f'(x) = \frac{3}{7}x^{-4/7} - \frac{6}{5}x^{-7/10}$$

10) $y = \frac{5}{4}r^4$

$$y' = 5r^3$$

11) $h(x) = \frac{3}{5}x^4$

$$h'(x) = \frac{12}{5}x^3$$

12) $f(x) = -\frac{3}{2}\sqrt[7]{x^5} - 1 + \frac{5}{3x^5}$

$$f'(x) = \frac{-15}{14}x^{-2/7} - \frac{25}{3}x^{-6}$$

13) $h = 2x^{\frac{2}{7}}$

$$h' = \frac{4}{7}x^{-5/7}$$

14) $t = \frac{7}{5}r^6 + \frac{9}{r^7}$

$$t' = \frac{42}{5}r^5 - 63r^{-8}$$

15) $h = -4t^{\frac{5}{4}} + \frac{1}{2} - \frac{1}{3t^6}$

$$h' = -5t^{1/4} + 2t^{-7}$$

16) $r = \frac{5}{4}x^8 - \frac{1}{9} - \frac{5}{4}x^{-1}$

$$r' = 10x^7 + \frac{5}{4}x^{-2}$$

17) $t = -\dfrac{1}{5}r^6 - r^{\frac{3}{2}} - r^{-7}$

$t' = -\dfrac{6}{5}r^5 - \dfrac{3}{2}r^{\frac{1}{2}} + 7r^{-8}$

18) $f = -\dfrac{4}{s^3} + \dfrac{1}{s^4}$

$f' = 12s^{-4} - 4s^{-5}$

19) $h = 7r^{\frac{3}{10}}$

$h' = \dfrac{21}{10}r^{-\frac{7}{10}}$

20) $h(x) = -7x^2 + \dfrac{9}{4}$

$h' = -14x$

Differentiate each function with respect to x.

21) $y = -4x^3(-4x^4 + 3)$

$y' = -4x^3(-16x^3) + (-4x^4 + 3)(-12x^2)$

$= 112x^6 - 36x^2$

22) $y = (3x^5 + 2) \cdot -2x^3$

$y' = (3x^5 + 2)(-6x^2) + (-2x^3)(15x^4)$

$= -48x^7 - 12x^2$

23) $y = (5x^5 + 5)(3x^4 + 5)$

$y' = (5x^5 + 5)(12x^3) + (3x^4 + 5)(25x^4)$

$= 135x^8 + 125x^4 + 60x^3$

24) $f(x) = (-5x^3 - 3)(-5x^4 + 5)$

$f' = (-5x^3 - 3)(-20x^3) + (-5x^4 + 5)(-15x^2)$

$= 175x^6 + 60x^3 - 75x^2$

25) $f(x) = (-3x^5 - 3)(2x^5 - 2x^4 - 4)$

$$f' = (-3x^5 - 3)(10x^4 - 8x^3) + (2x^5 - 2x^4 - 4)(-15x^2)$$

$$= -60x^9 + 54x^8 + 30x^4 + 24x^3$$

26) $f(x) = (-4x^3 - 4)(-3x^3 - 2x^2 + 5)$

$$f' = (-4x^3 - 4)(-9x^2 - 4x) + (-3x^3 - 2x^2 + 5)(-12x^2)$$

$$= 72x^5 + 40x^4 - 24x^2 + 16x$$

27) $y = \dfrac{4x^2}{5x^5 - 5}$

$$y' = \frac{(5x^5 - 5)(8x) - (4x^2)(25x^4)}{(5x^5 - 5)^2}$$

$$= \frac{-60x^6 - 40x}{(5x^5 - 5)^2}$$

28) $f(x) = \dfrac{3}{3x^3 + 5}$

$$f' = \frac{(3x^3 + 5)(0) - 3(9x^2)}{(3x^3 + 5)^2}$$

$$= \frac{-27x^2}{(3x^3 + 5)^2}$$

29) $y = \dfrac{x^5 - x^2}{5x^4 + 4}$

$$y' = \frac{(5x^4 + 4)(5x^4 - 2x) - (x^5 - x^2)(20x^3)}{(5x^4 + 4)^2}$$

$$= \frac{5x^8 + 10x^5 + 20x^4 - 8x}{(5x^4 + 4)^2}$$

30) $y = \dfrac{2x^2 + 5}{x^2 - 2}$

$$y' = \frac{(x^2 - 2)(4x) - (2x^2 + 5)(2x)}{(x^2 - 2)^2}$$

$$= \frac{-18x}{(x^2 - 2)^2}$$