Section 2.1 Techniques for Finding
Minimum homework: 1 – 19 odds, 21, 25, 29, 33,35, 37, 41, 45

#1-20: Use the Power rule to find the derivative of each function (write each answer with positive exponents)

1) $f(x) = 3x^2 + 4x - 7$

$$f'(x) = 2 \cdot 3x^{2-1} + 4 - 0$$

$$f'(x) = 6x + 4$$

3) $y = 5x^3 + 3x + 1$

$$\frac{dy}{dx} = 3 \cdot 5x^{3-1} + 3 + 0$$

$$\frac{dy}{dx} = 15x^2 + 3$$

5) $y = 9x^2 + 5x - 4$

$y' = 2 \cdot 9x^{2-1} + 5 - 0$

$y' = 18x + 5$

7) f(x) = 18

Constant / derivative is 0

$f'(x) = 0$

9) $y = 3\sqrt{x}$

$y = 3x^{1/2}$

$y' = \frac{1}{2} \cdot 3x^{1/2-1}$

$y' = \frac{3}{2} x^{1/2-2/2}$

$y' = \frac{3}{2} x^{-1/2}$

$y' = \frac{3}{2x^{1/2}}$

$y' = \frac{3}{2\sqrt{x}}$

11) $g(x) = 6\sqrt{x}$

$g(x) = 6x^{1/2}$

$g'(x) = \frac{1}{2} \cdot 6x^{1/2-1}$

$g'(x) = 3x^{1/2-2/2}$

$g'(x) = 3x^{-1/2}$

$g'(x) = \frac{3}{x^{1/2}}$

$g'(x) = \frac{3}{\sqrt{x}}$

13) $f(x) = 3x^{2/3}$

$$f'(x) = \frac{2}{3} \cdot 3x^{2/3 - 3/3}$$

$$f'(x) = 2x^{-1/3}$$

$$f'(x) = \frac{2}{x^{1/3}}$$

$$f'(x) = \frac{2}{\sqrt[3]{x}}$$

15) $f(x) = x^{1/3}$

$$f'(x) = \frac{1}{3}x^{1/3 - 3/3}$$

$$f'(x) = \frac{1}{3}x^{-2/3}$$

$$f'(x) = \frac{1}{3x^{2/3}}$$

$$f'(x) = \frac{1}{3\sqrt[3]{x^2}}$$

17) $y = \frac{3}{x^2}$

$y = 3x^{-2}$

$y' = -2 \cdot 3x^{-2-1}$

$y' = -6x^{-3}$

$y' = -\frac{6}{x^3}$

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

$f(x) = -3x^{-1}$

$f'(x) = -1 \cdot -3x^{-1-1}$

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

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

#21-32: Clear the parenthesis and then find the derivative of each function.

21) $y = (2x + 3)(3x – 4)$

$y = 6x^2 - 8x + 9x - 12$

$y = 6x^2 + 1x - 12$

$y' = 12x + 1 - 0$

$y' = 12x + 1$

23) $f(x) = (x – 2)(3x – 4)$

$f(x) = 3x^2 - 4x - 6x + 8$

$f(x) = 3x^2 - 10x + 8$

$f'(x) = 6x - 10$

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

$$f(x) = 3x^3 - 5x^2$$
$$+9x^2 - 15x$$
$$+6x - 10$$

$$f(x) = 3x^3 + 4x^2 - 9x - 10$$

$$f'(x) = 9x^2 - 8x - 9$$

27) $g(t) = (2t - 1)(3t + 5)$

$$g(t) = 6t^2 + 5t - 3t - 5$$

$$g(t) = 6t^2 + 2t - 5$$

$$g'(t) = 12t + 2$$

29) $y = 3x^2(2x^2 + 6x - 4)$

$$y = 6x^4 + 18x^3 - 12x^2$$

$$\frac{dy}{dx} = 24x^3 + 54x^2 - 24x$$

31) $f(x) = (5x^2)(4x)$

$$f(x) = 20x^3$$

$$f'(x) = 60x^2$$

#33-40: Rewrite the problem without a fraction and find the derivative of each function.

33) $f(x) = \frac{3x^2+6x}{2x}$

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

$$f(x) = \frac{3}{2}x + 3$$

$$f'(x) = 3/2$$

35) $y = \frac{x^2+2x}{x}$

$$y = \frac{x^2}{x} + \frac{2x}{x}$$

$$y = 1x + 2$$

$$y' = 1$$

37) $f(x) = \frac{24x^2+12x+60}{12}$

$$f(x) = \frac{24x^2}{12} + \frac{12x}{12} + \frac{60}{12}$$

$$f(x) = 2x^2 + 1x + 5$$

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

39) $f(x) = \frac{5x^2+6x+1}{x^2}$

$$f(x) = \frac{5x^2}{x^2} + \frac{6x}{x^2} + \frac{1}{x^2}$$

$$f(x) = 5 + \frac{6}{x} + \frac{1}{x^2}$$

$$f(x) = 5 + 6x^{-1} + 1x^{-2}$$

$$f'(x) = 0 - 6x^{-2} - 2x^{-3}$$

$$f'(x) = -\frac{6}{x^2} - \frac{2}{x^3}$$

#41-44:

a) Find the slope of the tangent line to the graph of the function for the given value of x.

b) Find the equation of the tangent line to the graph of the function for the given value of x.

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

a) $f'(x) = 6x + 6$

$m = f'(2) = 6(2) + 6$

$m = 18$

b) $y = 3(2)^2 + 6(2) - 2$

$y = 22$

point $(2, 22)$ $m = 18$

$y - 22 = 18(x - 2)$

$y - 22 = 18x - 36$

$+22 \quad +22$

$y = 18x - 14$

#41-44:

a) Find the slope of the tangent line to the graph of the function for the given value of x.

b) Find the equation of the tangent line to the graph of the function for the given value of x.

43) $f(x) = 9x^3 - 12x^2 + 5;\ \ x = 3$

a) $f'(x) = 27x^2 - 24x$

$m = f'(3) = 27(3)^2 - 24(3)$

$m = 171$

b) $y = f(3) = 9(3)^3 - 12(3)^2 + 5$

$y = 140$

Slope $m = 171$

point $(3, 140)$

$y - 140 = 171(x - 3)$

$y - 140 = 171x - 513$

$+140 \qquad +140$

$y = 171x - 373$

#45-48:

a) Find all values of x where the tangent line is horizontal

b) Find the equation of the tangent line to the graph of the function for the values of x found in part a.

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

(a) $f'(x) = 6x + 6$

$6x + 6 = 0$

$6x = -6$

$\frac{6x}{6} = \frac{-6}{6}$

$x = -1$

(b) $m = 0$ Since horizontal

$y = f(-1) = 3(-1)^2 + 6(-1) + 2$

$y = -1$

Point $(-1, -1)$

$y - (-1) = 0(x - (-1))$

$y + 1 = 0(x + 1)$

$y + 1 = 0$

$y = -1$

#45-48:

a) Find all values of x where the tangent line is horizontal

b) Find the equation of the tangent line to the graph of the function for the values of x found in part a.

47) f(x) = $-4x^2 + 24x - 9$

(a) $f'(x) = -8x + 24$

$-8x + 24 = 0$

$\frac{-8x}{-8} = \frac{-24}{-8}$

$x = 3$

(b) $y = f(3) = -4(3)^2 + 24(3) - 9$

$= 27$

Point $(3, 27)$ $m = 0$ (horizontal)

$y - 27 = 0(x - 3)$

$y - 27 = 0$

$y = 27$