p 207 HW #2 all, #3 all 1/3/2017

(2) a) $f(x) = x^2 + 2x + 1$ at $(-3, 4)$

Slope

$f'(x) = 2x + 2$

$f'(-3) = 2(-3) + 2$

$m = -4$

Point

$(-3, 4)$

$\boxed{y - 4 = -4(x + 3)}$

b) $f(x) = 2\sqrt{x} + 4$ at $x = 1$

$f(x) = 2x^{\frac{1}{2}} + 4$

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

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

$m = 1$

$f(x) = 2\sqrt{x} + 4$

$f(1) = 2\sqrt{1} + 4$

$f(1) = 6$

$(1, 6)$

$\boxed{y - 6 = 1(x - 1)}$

c) $f(x) = \dfrac{x^2 + 6}{x}$ at $(3, 5)$

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

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

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

$f'(3) = 1 - 6(3)^{-2}$

$f'(3) = 1 - \dfrac{6}{9}$

$f'(3) = \dfrac{3}{9}$

$m = \dfrac{1}{3}$

$(3, 5)$

$\boxed{y - 5 = \frac{1}{3}(x - 3)}$

d) $f(x) = \sqrt[4]{x} + \dfrac{8}{\sqrt{x}}$ at $x = 1$

$f(x) = x^{\frac{1}{4}} + 8x^{-\frac{1}{2}}$

$f'(x) = \frac{1}{4}x^{-\frac{3}{4}} + 8\left(-\frac{1}{2}\right)x^{-\frac{3}{2}}$

$f'(x) = \frac{1}{4}x^{-3/4} - 4x^{-3/2}$

$f'(1) = \frac{1}{4}(1)^{-3/4} - 4(1)^{-3/2}$

$f'(1) = \frac{1}{4}(1) - 4(1)$

$f'(1) = \frac{1}{4} - 4$

$f'(1) = \frac{1}{4} - \frac{16}{4}$

$f'(1) = -\frac{15}{4}$

$m = -\frac{15}{4}$

$f(x) = \sqrt[4]{x} + \frac{8}{\sqrt{x}}$

$f(1) = \sqrt[4]{1} + \frac{8}{\sqrt{1}}$

$f(1) = 1 + \frac{8}{1}$

$f(1) = 9$

$(1, 9)$

$\boxed{y - 9 = -\frac{15}{4}(x - 1)}$

(3)

a) $f(x) = 2x^2 - x - 3$ at $(2,3)$

slope

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

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

$f'(2) = 4(2) - 1$

$f'(2) = 7$

tangent slope = 7

normal slope = $\frac{-1}{7}$

point

$(2,3)$

$$y - 3 = \frac{-1}{7}(x - 2)$$

b) $f(x) = \frac{4}{x} - \frac{1}{x^2}$ at $x = -1$

slope

$f(x) = \frac{4}{x} - \frac{1}{x^2}$

$f(x) = 4x^{-1} - x^{-2}$

$f'(x) = -4x^{-2} + 2x^{-3}$

$f'(-1) = -4(-1)^{-2} + 2(-1)^{-3}$

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

$f'(-1) = -4 - 2$

$f'(-1) = -6$

normal slope = $\frac{1}{6}$

point

$f(x) = \frac{4}{x} - \frac{1}{x^2}$

$f(-1) = \frac{4}{-1} - \frac{1}{(-1)^2}$

$f(-1) = -4 - 1$

$f(-1) = -5$

$(-1, -5)$

$$y + 5 = \frac{1}{6}(x + 1)$$

c) $f(x) = (2x+1)^2$ at $(2, 25)$

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

$f(x) = 4x^2 + 4x + 1$

$f'(x) = 8x + 4$

$f'(2) = 8(2) + 4$

$f'(2) = 16 + 4$

$f'(2) = 20$

normal slope = $\frac{-1}{20}$

point!

$(2,25)$

$$y - 25 = \frac{-1}{20}(x - 2)$$

d) $f(x) = 2\sqrt[3]{x} - \frac{4}{x^2}$ at $x = 1$

$f(x) = 2x^{\frac{1}{3}} - 4x^{-2}$

$f'(x) = \frac{2}{3}x^{-\frac{2}{3}} + 8x^{-3}$

$f'(1) = \frac{2}{3}(1)^{-\frac{2}{3}} + 8(1)^{-3}$

$f'(1) = \frac{2}{3} + 8$

$f'(1) = \frac{2}{3} + \frac{24}{3}$

$f'(1) = \frac{26}{3}$

normal slope = $\frac{-3}{26}$

$f(x) = 2\sqrt[3]{x} - \frac{4}{x^2}$

$f(1) = 2\sqrt[3]{1} - \frac{4}{1^2}$

$f(1) = 2 - 4$

$f(1) = -2$

$(1, -2)$

$$y + 2 = \frac{-3}{26}(x - 1)$$