Questions from Homework

⑧ $6x - y = 4$

$-y = -6x + 4$

$y = 6x - 4$

$m = 6$

$y = x\sqrt{x}$

$y = x(x^{1/2})$

$y = x^{3/2}$

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

$6 = \frac{3\sqrt{x}}{2}$

$12 = 3\sqrt{x}$

$4 = \sqrt{x}$

$\boxed{16 = x}$

$y = x\sqrt{x}$

$y = (16)\sqrt{16}$

$y = 16(4)$

$\boxed{y = 64}$

$\boxed{(16, 64)}$

⑦ $y = 3x^2$

$y' = 6x$

$24 = 6x$

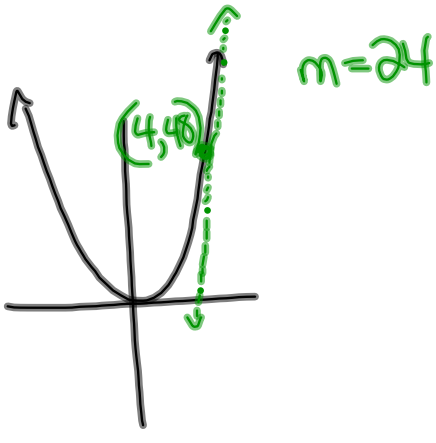
$4 = x$

$y = 3(4)^2$

$= 3(16)$

$= 48$

$(4, 48)$



Questions from Homework

Ex 2.2.

④ c) $xy = 1$, $(5, \frac{1}{5})$

$$y = \frac{1}{x}$$

$$y = x^{-1}$$

① $y' = -x^{-2}$

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

② $y'(5) = \frac{-1}{(5)^2}$

$$y'(5) = \frac{-1}{25}$$

"m"

③ $y - y_1 = m(x - x_1)$

$$y - \frac{1}{5} = \frac{-1}{25}(x - 5)$$

$\times 25$: $y - \frac{1}{5} = \frac{-x}{25} + \frac{5}{25}$

$$25y - 5 = -x + 5$$

$$\boxed{x + 25y - 10 = 0}$$

Warm Up

Differentiate the following:

$$f(x) = -4x^2 - 5x(x^3+7)^2 + 2\sqrt[5]{x^9} - \frac{5}{x^{10}} + \frac{7x^2}{\sqrt{x}}$$

$= -4x^2 - 5x(x^6+14x^3+49) + 2x^{9/5} - 5x^{-10} + 7x^2(x^{-1/2})$

$= -4x^2 - 5x^7 - 70x^4 - 245x + 2x^{9/5} - 5x^{-10} + 7x^{3/2}$

$F'(x) = -8x - 35x^6 - 280x^3 - 245 + \frac{18}{5}x^{4/5} + 50x^{-11} + \frac{21}{2}x^{1/2}$

$= -8x - 35x^6 - 280x^3 - 245 + \frac{18\sqrt[5]{x^4}}{5} + \frac{50}{x^{11}} + \frac{21\sqrt{x}}{2}$

Differentiation Rules

Product Rule:

The Product Rule If f and g are both differentiable, then

$$\frac{d}{dx}[f(x)g(x)] = f(x)\frac{d}{dx}[g(x)] + g(x)\frac{d}{dx}[f(x)]$$

Express the product rule verbally if you are considering a function of the form...

$f(x)$ = (First) X (Second)

In words, ***the Product Rule*** says that the ***derivative of a product of two functions is: the first function times the derivative of the second function, plus the derivative of the first function times the second function***

Get in the habit of verbalizing the rule as you differentiate...it will help when the functions get more complicated.

Examples:

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

$y' = (2x^3+5)(6x-1) + (6x^2)(3x^2-x)$

$= 12x^4 - 2x^3 + 30x - 5 + 18x^4 - 6x^3$

$= 30x^4 - 8x^3 + 30x - 5$

$$f(x) = \sqrt{x}(2 - 3x)$$

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

$F'(x) = (x^{1/2})(-3) + \left(\frac{1}{2}x^{-1/2}\right)(2-3x)$

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

$= -\frac{9}{2}x^{1/2} + x^{-1/2}$

$= \frac{1}{\sqrt{x}} - \frac{9\sqrt{x}}{2}$

$= \frac{2-9x}{2\sqrt{x}}$

Examples:

$$f(x)=\left(7x^3-x^2+5\right)\left(x^9+3x-5\right)$$

$$f'(x)=(7x^3-x^2+5)(9x^8+3)+(21x^2-2x)(x^9+3x-5)$$

$$=63x^{11}+21x^3-9x^{10}-3x^2+45x^8+15+21x^{11}+63x^3-105x^2-2x^{10}-6x^{10}+10x$$

$$=84x^{11}-11x^{10}+45x^8+84x^3-114x^2+10x+15$$

$$h(t)=\left(t^3-5t\right)\left(6\sqrt{t}-t^{-5}\right)$$

Homework