Questions from Homework

⑧ $6x - y = 4$

$ -y = -6x + 4$

$ y = 6x - 4$

$ m = 6$

$y = x\sqrt{x}$

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

$y = x^{3/2}$

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

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

$12 = 3\sqrt{x}$

$4 = \sqrt{x}$

$\boxed{16 = x}$

$y = x\sqrt{x}$

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

$y = 16(4)$

$\boxed{y = 64}$

$\boxed{(16, 64)}$

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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 $y - y_1 = m(x - x_1)$

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

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

$25y - 5 = -x + 5$

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

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...

$$f(x) = \text{(First)} \times \text{(Second)}$$

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:

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

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

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

$$\boxed{= 30x^4 - 8x^3 + 30x - 5}$$

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

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

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

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

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

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

Examples:

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

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

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

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

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

Homework

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