Questions from Homework

① g) $y = \frac{x+1}{\sqrt{x}} = \frac{x+1}{x^{1/2}} = x^{-1/2}(x+1) = x^{1/2} + x^{-1/2}$

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

k) $u(t) = a + \frac{b}{t} + \frac{c}{t^2} = a + bt^{-1} + ct^{-2}$

$u'(t) = 0 - bt^{-2} - 2ct^{-3}$

$= -\frac{b}{t^2} - \frac{2c}{t^3} = \frac{-bt^3 - 2ct^2}{t^5} = \frac{t^2(-bt-2c)}{t^5 \; t^3}$

b) $v(r) = \sqrt{r}(2+3r) = r^{1/2}(2+3r) = 2r^{1/2} + 3r^{3/2}$

$v'(r) = r^{-1/2} + \frac{9r^{1/2}}{2} = \frac{1}{r^{1/2}} + \frac{9r^{1/2}}{2} = \frac{1}{\sqrt{r}} + \frac{9\sqrt{r}}{2}$

$= \frac{2+9r}{2\sqrt{r}}$

③ c) $y = x + \frac{6}{x} = x + 6x^{-1}$ (2,5) Point

① $y' = 1 - 6x^{-2} = 1 - \frac{6}{x^2}$ ② $y'(2) = 1 - \frac{6}{(2)^2}$

$= 1 - \frac{3}{2}$

$= \frac{2-3}{2}$

$= -\frac{1}{2}$ ← m /

③ $y - y_1 = m(x - x_1)$

$y - 5 = -\frac{1}{2}(x-2)$

$2y - 5 = -x + 2$

$2y - 10 = -x + 2$

$x + 2y - 12 = 0$ /

Warm Up

Differentiate the following:

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

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

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

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

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***

$$(fg)' = fg' + f'g$$

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