Example 8: page 180 #28

Find the derivative of $h(x) = x^2 \arctan(5x)$

$$h'(x) = (2x)(\arctan(5x)) + \left(\frac{1}{1+25x^2}\right)(5)(x^2)$$

$$\boxed{h'(x) = 2x\arctan(5x) + \frac{5x^2}{1+25x^2}}$$

(11) $x^3 - 3x^2y + 2xy^2 = 12$

$$3x^2 - \left[(6x)y + \frac{dy}{dx}(3x^2)\right] + (2)y^2 + 2y\frac{dy}{dx}(2x) = 0$$

$$3x^2 - 6xy - 3x^2\frac{dy}{dx} + 2y^2 + 4xy\frac{dy}{dx} = 0$$

$$\frac{dy}{dx}\left[-3x^2 + 4xy\right] = -3x^2 + 6xy - 2y^2$$

$$\frac{dy}{dx} = \frac{-3x^2 + 6xy - 2y^2}{-3x^2 + 4xy}$$

3.4 1

(91) $y = \ln\left(x\sqrt{x^2-1}\right)$

$f \cdot g$

$u = x\sqrt{x^2-1}$

$u' = 1\left(\sqrt{x^2-1}\right) + g'(x)$

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

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

$u' = \sqrt{x^2-1} + \frac{x}{\sqrt{x^2-1}} \cdot x$

$u' = \sqrt{x^2-1} + \frac{x^2}{\sqrt{x^2-1}}$

$$y' = \left(\frac{1}{x\sqrt{x^2-1}}\right)\left(\sqrt{x^2-1} + \frac{x^2}{\sqrt{x^2-1}}\right)$$

$$\frac{\sqrt{x^2-1} + \frac{x^2}{\sqrt{x^2-1}}}{x\sqrt{x^2-1}} = \frac{\cancel{\sqrt{x^2-1}}}{x\cancel{\sqrt{x^2-1}}} + \frac{\frac{x^2}{\sqrt{x^2-1}}}{\frac{x\sqrt{x^2-1}}{1}}$$

$$\frac{1}{x} + \frac{x^2}{\sqrt{x^2-1}} \cdot \frac{1}{x\sqrt{x^2-1}}$$

$$\frac{x^{\cancel{2}}}{\cancel{x}(x^2-1)}$$

$$\frac{1}{x} + \frac{x}{x^2-1}$$