Homework 7:

4) $f(x) = -x^3 + 9x^2 - 6x + 9$ tangent line @ $(7, 65)$

$f'(x) = -3x^2 + 18x - 6$

$f'(7) = -3 \cdot 49 + 126 - 6$

$= -27$

$y - 65 = -27(x - 7)$

$y - 65 = -27x + 189$

$y = -27x + 254$

$$f(x) = \frac{1 - \cos(x)}{\sin(x)} = \frac{1}{\sin(x)} - \frac{\cos(x)}{\sin(x)} = \csc(x) - \cot(x)$$

$$f'(x) = -\csc(x)\cot(x) + \csc^2(x)$$

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

$$f'(x) = \frac{\sin^2 x - (\cos x - \cos^2 x)}{\sin^2 x} = \frac{\sin^2 x - \cos x + \cos^2 x}{\sin^2 x}$$

$$= \frac{1 - \cos x}{\sin^2 x} = \frac{1}{\sin^2 x} \cdot \frac{\cos x}{\sin^2 x} = \csc^2 x - \csc x \cot x$$

$\frac{1}{\sin x} \cdot \frac{\cos x}{\sin x}$

$f(x) = e^x + e^{-x}$

$f'(x) = e^x - e^{-x}$

$0 = e^x - e^{-x}$

$e^{-x} = e^x$

$\ln e^{-x} = \ln e^x$

$-x \ln e = x \ln e$

$-x = x$

$x = 0$

Quotient Rule

$$f(x) = \frac{xe^x + \sin x}{(x-1)(x+3)} = \frac{xe^x + \sin x}{x^2 + 2x - 3}$$

$$f'(x) = \frac{(x^2+2x-3)(xe^x + e^x + \cos x) - (xe^x + \sin x)(2x+2)}{(x^2+2x-3)^2}$$