Section 3.1 # 22

$h(t) = 2x^3 + 3$

$$h'(t) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{2(x+\Delta x)^3 + 3 - (2x^3+3)}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{2x^3 + 6x^2\Delta x + 6x(\Delta x)^2 + 2(\Delta x)^3 + 3 - 2x^3 + 3}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{6x^2\Delta x + 6x(\Delta x)^2 + 2(\Delta x)^3}{\Delta x}$$

$$= \lim_{\Delta x \to 0} 6x^2 + 6x\,\Delta x + 2(\Delta x)^2$$

$$= 6x^2$$

Section 3.2 # 18

$$f(x) = \frac{x^2+3}{x^2+5}$$

$$f'(x) = \frac{(x^2+5)(x^2+3)' - (x^2+3)(x^2+5)'}{(x^2+5)^2}$$

$$= \frac{(x^2+5)(2x) - (x^2+3)(2x)}{(x^2+5)^2}$$

Section 3.3 # 4

$$g(t) = 2\sec t + 3\tan t - \tan\frac{\pi}{3}$$

$$g'(t) = 2(\sec t)(\tan t) + 3\sec^2 t$$