5.5 Bases Other Than e

$$\frac{d}{dx}[a^u] = (\ln a)\, a^u \cdot \frac{du}{dx}$$

$$\frac{d}{dx}[\log_a u] = \frac{1}{(\ln a)u} \cdot \frac{du}{dx}$$

#1-2) Find derivative.

1) $f(t) = \dfrac{3^{2t}}{t}$ $\quad f'(t) = \dfrac{t(\ln 3 \cdot 3^{2t} \cdot 2) - 3^{2t}}{t^2}$

$$f'(t) = \frac{2t \cdot 3^{2t} \ln 3 - 3^{2t}}{t^2} = \frac{3^{2t}(2t \ln 3 - 1)}{t^2}$$

2) $h(x) = \log_5 \dfrac{x\sqrt{x-1}}{2} = \log_5 x + \frac{1}{2}\log_5 (x-1) - \log_5 2$

$$h'(x) = \frac{1}{(\ln 5)x} + \frac{1}{2} \cdot \frac{1}{(\ln 5)(x-1)} - 0$$

$$h'(x) = \frac{1}{\ln 5}\left(\frac{1}{x} + \frac{1}{2(x-1)}\right)$$

3) Eqn of tangent line:

$y = 5^{x-2}$ at $(2,1)$

$y' = (\ln 5)\, 5^{x-2} \cdot 1$

$y' = (\ln 5)\, 5^{x-2}$

$y'(2) = \ln 5 \cdot 5^0 = \ln 5$

$y - 1 = \ln 5 (x-2)$