1. Find an equation of the tangent line to the curve at the given point.

$$y = \sqrt{1 + x^{3}}, \quad (2,3)$$

$$y' = \frac{1}{2}(1 + x^{3})^{-\frac{1}{2}}(3x^{2})$$

$$y'_{x=2} = \frac{1}{2}(9)^{-\frac{1}{2}}(3\cdot 4) = \frac{1}{2} \cdot \frac{1}{3} \cdot 3\cdot 4 = 2$$

$$y - 3 = 2(x - 2)$$

$$y = 3 + 2(x - 2)$$

$$y = 2x - 1$$

2. If F(x) = f(g(x)), and if f(-2)' = 8, f'(-2) = 4, f'(5) = 3, g(5) = -2, and g'(5) = 6, find F'(5).

$$F'(5) = f(g(5))g'(5)$$

= $f'(-2) \cdot 6$
= $4 \cdot 6 = 24$

3. Find the 49th derivative of $f(x) = x e^{-x}$.

$$\int_{0}^{1}(x) = e^{-x} - xe^{-x}$$

$$\int_{0}^{1}(x) = -e^{-x} - (e^{-x} - xe^{-x})$$

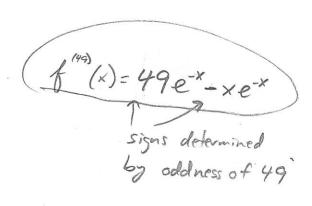
$$= -2e^{-x} + xe^{-x}$$

$$\int_{0}^{1}(x) = 2e^{-x} + (e^{-x} - xe^{-x})$$

$$= 3e^{-x} - xe^{-x}$$

$$\int_{0}^{1}(x) = -3e^{-x} - (e^{-x} - xe^{-x})$$

$$= -4e^{-x} + xe^{-x}$$



4. Find the derivative of the function. You do not need to simplify your answer.

(a)
$$y = \left(x + \frac{1}{x}\right)^7$$

$$y' = 7\left(x + \frac{1}{x}\right)^6 \left(1 - \frac{1}{x^2}\right)$$

(b)
$$f(\theta) = \cos(\theta^2)$$

 $f'(0) = -\sin(\theta^2) \ 2\theta = -2\theta\sin(\theta^2)$

(c)
$$g(t) = 2^{t^3} = (e^{\ln 2})^{t^3} = e^{t^3 \ln 2}$$

$$\frac{dg}{dt} = e^{t^3 \ln 2} (3 \ln 2) t^2 = (3 \ln 2) t^2 2^{t^3}$$

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

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