

$$1. \quad f(0)=2 \quad g(0)=4 \\ f'(0)=3 \quad g'(0)=5$$

$$(a) \quad \frac{d}{dx} (f(2x)g(3x)) \\ = 2f'(2x) \cdot g(3x) + f(2x) \cdot g'(3x) \cdot 3 \\ @ x=0 \\ = 2 \cdot 3 \cdot 4 + 2 \cdot 5 \cdot 3 \\ = 54$$

$$(b) \quad \frac{d}{dx} \left(\frac{f(2x)}{g(3x)} \right) \\ = \frac{g(3x) \cdot f'(2x) \cdot 2 - f(2x)g'(3x) \cdot 3}{(g(3x))^2}$$

$$@ x=0 \\ = \frac{4 \cdot 3 \cdot 2 - 2 \cdot 5 \cdot 3}{4^2} \\ = \frac{-3}{8}$$

$$(c) \quad \frac{d}{dx} (f(2x))^2 \\ = 2f(2x) \cdot f'(2x) \cdot 2 \\ @ x=0 \\ = 2 \cdot 2 \cdot 3 \cdot 2 \\ = 24$$

L13 P3

$$2. \quad x = e^{\ln(x)}$$

$$\frac{d}{dx}(x) = \frac{d}{dx}(e^{\ln(x)})$$

$$1 = e^{\ln(x)} \cdot \frac{d}{dx}(\ln(x))$$

$$1 = x \cdot \frac{d}{dx}(\ln(x))$$

$$\frac{1}{x} = \frac{d}{dx}(\ln(x))$$

$$3. (a)$$

$$a^x = e^{\ln(a^x)} = e^{x \ln(a)}$$

$$(b)$$

$$\frac{d}{dx}(a^x) = \frac{d}{dx}(e^{x \ln(a)})$$

$$= e^{x \ln(a)} \cdot \ln(a)$$

$$= a^x \cdot \ln(a)$$

$$(c)$$

$$\frac{d}{dx}(e^x) = e^x \cdot \ln(e) = e^x \cdot 1 = e^x$$

$$4. \quad x = a^{\log_a(x)}$$

$$1 = a^{\log_a(x)} \cdot \ln(a) \cdot \frac{d}{dx}(\log_a(x))$$

$$1 = x \cdot \ln(a) \cdot \frac{d}{dx}(\log_a(x))$$

$$\frac{1}{x \cdot \ln(a)} = \frac{d}{dx}(\log_a(x))$$