

$$1. (a) g'(x) = \frac{2}{x} + \sqrt{5x^3 + \sin(e^{7x})} + x \cdot \frac{15x^2 + \cos(e^{7x}) \cdot 7x}{2\sqrt{5x^3 + \sin(e^{7x})}}$$

$$(b) f'(t) = 10^x \ln 10 + \frac{(-2 \sin x)(x^2 + 1) - (2 \cos x)(2x)}{(x^2 + 1)^2}$$

$$2. (a) y' = [\ln(1+x^2) + 2x \tan^{-1}(x)] (1+x^2)^{\tan^{-1}(x)-1}$$

$$(b) f'(0) = 0$$

$$3. (a) -\frac{1}{4} \quad (b) \frac{1}{\sqrt{2}}$$

$$4. x = \sqrt[6]{\frac{1}{2}}, \quad y = 2^{-2/3}$$

$$5. (a) \text{DNE} \quad (b) \infty \quad (c) (-6, -3), (5, 7), (7, 8)$$

$$(d) -8, -6, -3, 4, 5, 8 \quad (e) f'(0) = \frac{5}{3} \quad (f) f'(3) = \frac{5}{3}$$

$$6. y = x \text{ and } y = -2x + 15$$

$$7. (a) \frac{dy}{dx} = \frac{-3x^2 + 12x + 2}{4y^3} \quad (b) (0,0), (-3, 633, 0), (6.317, 0) \quad (c) (4.16, 2.517), (4.16, -2.517)$$

$$8. \frac{ds}{dt} = -\frac{2}{25} \text{ cm}^2/\text{min}$$

$$9. y \approx -0.002$$

$$10. (a) \text{Increasing: } (-\pi, -\frac{\pi}{3}), (\frac{\pi}{3}, -\frac{\pi}{3} + 2\pi), (\frac{\pi}{3} + 2\pi, 3\pi)$$

$$\text{Decreasing: } (-\frac{\pi}{3}, \frac{\pi}{3}), (-\frac{\pi}{3} + 2\pi, \frac{\pi}{3} + 2\pi)$$

$$(b) \text{Concave up: } (0, \pi), (2\pi, 3\pi)$$

$$\text{Concave down: } (-\pi, 0), (\pi, 2\pi)$$

$$(c) \text{Local max: } f(-\frac{\pi}{3}) = -\frac{\pi}{3} + \sqrt{3}, f(-\frac{\pi}{3} + 2\pi) = \frac{5\pi}{3} + \sqrt{3}$$

$$\text{Local min: } f(\frac{\pi}{3}) = \frac{\pi}{3} - \sqrt{3}, f(\frac{\pi}{3} + 2\pi) = \frac{7\pi}{3} - \sqrt{3}$$

$$\text{Global max: } f(3\pi) = 3\pi \quad \text{Global min: } f(-\pi) = -\pi$$