

1. (a)  $f'(x) = 10^x \cdot \ln(10) \cdot \tan^2(x) + 10^x \cdot 2 \tan(x) \cdot \sec^2(x)$

(b)  $g'(x) = \frac{5(e^x + 1)^4 e^x \sqrt{x^2 + 4} - (e^x + 1)^5 \cdot \frac{1}{2}(x^2 + 4)^{-1/2} \cdot 2x}{x^2 + 4}$

(c)  $y' = \left( \frac{\ln(x^2 + 4)}{x} + \frac{2x \ln x}{x^2 + 4} \right) \cdot (x^2 + 4)^{\ln x}$

2. (a) 0 (b)  $3 \cdot 2^{-5/6}$  (c)  $-\frac{3}{2}$

3. (a) 3 times (b) Only at the origin (c)  $0 \leq t \leq \frac{\pi}{2}$  (d)  $\Delta t = \sqrt{3}$

4. (a)  $y' = \frac{x(25 - 6x^2 - 6y^2)}{y(6x^2 + 6y^2 + 25)}$

(b)  $y = \frac{2}{11}x + \frac{15}{11}$

5. (a) -1.8 (b) No such points (c)  $-5 \leq x \leq -\frac{8}{3}$  or  $-2 \leq x \leq \frac{4}{3}$  (d) Jump discontinuity at  $x = -2$ .

6.  $\frac{dh}{dt} = \frac{8}{9\pi}$  cm/sec

7. (i)  $x = 12$  (ii)  $x = \frac{12\pi}{3\sqrt{3} + \pi}$

8. (a) Increasing:  $x < 0$ ,  $x \neq -2$  Decreasing:  $x > 0$ ,  $x \neq 2$

(b) Concave down:  $-2 < x < 2$  Concave up:  $x < -2$  or  $x > 2$

(c) Horizontal asymptote:  $y = 0$  Vertical asymptotes:  $x = -2$  and  $x = 2$

