

1.  $\lim_{h \rightarrow 0} \frac{4(x+h)^2 - 3(x+h) + 5 - (4x^2 - 3x + 5)}{h} = 8x - 3$

2.  $\lim_{h \rightarrow 0} \frac{\frac{1}{(x+h)+1} - \frac{1}{x+1}}{h} = -\frac{1}{(x+1)^2}$

3. Yes. No. Curve not smooth, so limits from the left and right will not be equal.

4.  $x = -2, 2$

5. a. 56 b. 58

6. a.  $f'(x) = \frac{3e^x \left(5 - e^x\right)^{\frac{1}{2}}}{2x^2}$     b.  $f'(x) = \frac{20x(x-1)(5x^2+3) - (5x^2+3)^2}{(x-1)^2}$

c.  $f'(x) = \frac{x(x+5)^2}{(x^2+1)^{\frac{1}{2}}} + 2(x+5)(x^2+1)^{\frac{1}{2}}$     d.  $f'(x) = -1$     e.  $f'(x) = 0$

f.  $f'(x) = \frac{4}{3}x \sec^2 \frac{x^2}{3} \tan \frac{x^2}{3}$     g.  $f'(x) = \frac{x}{x^2+1} - \frac{1}{x} - \frac{12x^2}{2x^3-1}$

h.  $f'(x) = -3(\ln 10)10^{\csc^3 x} \csc 3x \cot 3x$     i.  $y' = \frac{-6\cos^5 x}{(1+\sin x)^6}$     j.  $y' = -\frac{\tan(\ln x)}{x}$

k.  $y' = 2x + \frac{2}{x^3}$

7.  $y = 2$

8. No, function cannot equal 0.

9. a.  $f'(x) = x^2 - 4x - 5$  b.  $\left(-1, \frac{17}{3}\right)$  and  $\left(5, -\frac{91}{3}\right)$

10. 5

11. a.  $f(x) = (e^{2x} + 1)^3$     b.  $f(x) = \sqrt{\ln x}$

12. TRUE, sixth derivative would be a constant.

$$\frac{d}{dx}(fgh) = \frac{d}{dx}(f(gh))$$

$$\begin{aligned} 13. \quad &= f(gh' + hg') + f'(gh) \\ &= f'gh + fg'h + fgh' \end{aligned}$$

14. done in class, see notes

15. False. Need product rule.