Lesson 3.4.2

3-156. Typical response: If $f(c)$ does not exist, there is no point of tangency for the tangent. If both sides of the limit of $f(x)$ as $x \to$ c do not agree, then there cannot be a tangent at $f(c)$.

3-157. See below:

a. Solution: $f(x)=\begin{cases} 2+(x+0.1)^2 & \text{for } x<0 \\ 2+(x-0.1)^2 & \text{for } x\geq 0 \end{cases}$

b. No; there is a cusp at $f(0)$.

c. Solution: $f'(x)=\begin{cases} 2(x+0.1) & \text{for } x<0 \\ 2(x-0.1) & \text{for } x>0 \end{cases}$

d. no

3-158. $f'(x) = 8x$, 88, 8000

3-159. See below:

b. left limit $\to -1$, right limit $\to 1$. Since they do not agree, y' does not exist at $x = 0$.

c. Most calculators will incorrectly provide a slope of 0 at the vertex.

d. Due to symmetry, the difference quotient will always result in zero for this function when $x = 0$. Therefore, since the limit as is 0, the calculator will falsely state that $f'(0) = 0$.

3-160. See below:

a. There are 16 combinations.

b. 10 solutions:

c. 8 solutions:

3-161. $y = -4x$; Point of intersection: $\left(\frac{4}{3}, -\frac{16}{3}\right)$

3-163. ≈ 9.697

3-165. See below:

a. $-\frac{2}{3}x^{-5/3}$

b. $\frac{3}{2}\sqrt{x}$

c. 0

d. $-\frac{2}{x^2}$

3-166. See below:

a. $F(x) = 2x^{3/2} - \frac{7}{2}x^2 + C$

b. $F(x) = \sin x - 2\cos x + C$

3-167. See below:

a. $g(x) = 3x - 11$, $f(x) = \cos x$

b. $g(x) = 2^x - 1$, $f(x) = \sqrt[3]{x}$

c. $g(x) = 5 - 2x$, $f(x) = 3^x$

3-168. See below:

a. $-\frac{1}{2\sqrt{3}}$

b. $-\frac{5}{2}$

c. 4

d. 1

3-169. $f'(x) = 2$