Answers to problems on page 153 of the Unit 1 Review (Section 2.1 review problems)

8. a) Not continuous at x = 2 (non-removable discontinuity)

b) Not differentiable at x = 2 (because it's not continuous there)

10.

$$h(x) = \frac{3}{8}x - 2x^2$$

$$h'(x) = \lim_{h \to 0} \frac{\frac{3}{8}(x+h) - 2(x+h)^2 - \left(\frac{3}{8}x - 2x^2\right)}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{\frac{3}{8}x} + \frac{3}{8}h - \cancel{2x^2} - 4xh - 2h^2 - \cancel{\frac{3}{8}x} + \cancel{2x^2}}{h}$$

$$= \lim_{h \to 0} \frac{\frac{3}{8}h - 4xh - 2h^2}{h} = \lim_{h \to 0} \frac{\cancel{h}\left(\frac{3}{8} - 4x - 2h\right)}{\cancel{h}}$$

$$= \lim_{h \to 0} \frac{3}{8} - 4x - 2h = \frac{3}{8} - 4x$$

since

$$h'(x) = \frac{3}{8} - 4x$$

then

$$h'(-2) = \frac{3}{8} - 4(-2)$$

$$= \frac{3}{8} + \frac{8 \cdot 8}{8}$$

$$= \frac{3}{8} + \frac{64}{8} = \frac{67}{8}$$

12. a)

$$f(x) = \frac{2}{x+1}$$

$$f'(x) = \lim_{h\to 0} \frac{\frac{2}{x+h+1} - \frac{2}{x+1}}{h}$$

$$= \lim_{h\to 0} \frac{\frac{2\cdot(x+1)}{(x+h+1)\cdot(x+1)} - \frac{2\cdot(x+h+1)}{(x+1)\cdot(x+h+1)}}{h}$$

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

$$= \lim_{h\to 0} \frac{2x+2-2x-2h-2}{(x+h+1)(x+1)} \cdot \frac{1}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{2x}+\cancel{2}-\cancel{2x}-2h-\cancel{2}}{(x+h+1)(x+1)} \cdot \frac{1}{h}$$

$$= \lim_{h\to 0} \frac{-2\cancel{h}}{(x+h+1)(x+1)} \cdot \frac{1}{\cancel{h}}$$

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

$$= \frac{-2}{(x+1)^2}$$

Since $f'(x) = \frac{-2}{(x+1)^2}$

then $f'(0) = -2$

using a slope of -2 and the point $(0,2)$ the equation of the tangent line is $\boxed{y = -2x + 2}$

16. The graph that is between the y values of 0 and 1 is f(x) and the graph that is between the y values of -1 and 1 is f ’(x).