

Exercise 3:

$$g(x) = \sqrt{8x+1}$$

1. a.  $\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$

$$\Gamma_6(h) = \frac{f(6+h) - f(6)}{h}$$

$$= \frac{(\sqrt{8(6+h)+1}) - (\sqrt{8 \times 6 + 1})}{h}$$

$$= \frac{(\sqrt{48+8h+1}) - (\sqrt{48+1})}{h}$$

$$= \frac{\sqrt{49+8h} - \sqrt{49}}{h}$$

$$= \frac{\sqrt{49+8h} \times \sqrt{49+8h} - \sqrt{49} \times \sqrt{49}}{h + \sqrt{49+8h} + \sqrt{49}}$$

$$= \frac{49+8h - 49}{h + \sqrt{49+8h} + \sqrt{49}}$$

$$= \frac{8}{\sqrt{49+8h} + 7}$$

$$g'(6) = \frac{8}{\sqrt{49+8h} + 7}$$

2. a.  $\Gamma_a(h) = \frac{f(a+h) - f(a)}{h}$

$$= \frac{(\sqrt{8(a+h)+1}) - \sqrt{8a+1}}{h}$$

$$= \frac{(\sqrt{8(a+h)+1}) - (\sqrt{8a+1})}{h}$$

$$= \frac{(\sqrt{8(a+h)+1} \times \sqrt{8(a+h)+1}) - (\sqrt{8a+1} \times \sqrt{8a+1})}{h + \sqrt{8(a+h)+1} + \sqrt{8a+1}}$$

$$= \frac{8(a+h)+1 - 8a-1}{h + \sqrt{8(a+h)+1} + \sqrt{8a+1}} = \frac{8h}{h + \sqrt{8(a+h)+1} + \sqrt{8a+1}}$$