

2) Use the definition of the derivative to find $g'(x)$ for $g(x) = \sqrt{2+3x}$

$$\lim_{h \rightarrow 0} \frac{g(x+h) - g(x)}{h} = \lim_{h \rightarrow 0} \frac{\sqrt{2+3(x+h)} - \sqrt{2+3x}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{(\sqrt{2+3x+3h} - \sqrt{2+3x})}{h} \cdot \frac{\sqrt{2+3x+3h} + \sqrt{2+3x}}{\sqrt{2+3x+3h} + \sqrt{2+3x}}$$

$$= \lim_{h \rightarrow 0} \frac{2+3x+3h - (2+3x)}{h(\sqrt{2+3x+3h} + \sqrt{2+3x})}$$

$$= \lim_{h \rightarrow 0} \frac{\cancel{2+3x} + 3h - \cancel{2} - \cancel{3x}}{h(\sqrt{2+3x+3h} + \sqrt{2+3x})}$$

$$= \lim_{h \rightarrow 0} \frac{3h}{h(\sqrt{2+3x+3h} + \sqrt{2+3x})}$$

$$= \lim_{h \rightarrow 0} \frac{3}{\sqrt{2+3x+3h} + \sqrt{2+3x}} = \frac{3}{2\sqrt{2+3x}} = g'(x)$$