

Homework Section 3.5

#53 $f(x) = \sqrt{x}$; $x = 4$

Step 1 $m_{\text{tan}} = \lim_{h \rightarrow 0} \left(\frac{f(x+h) - f(x)}{h} \right)$

$$f(x+h) = \sqrt{x+h} \quad \text{and} \quad f(x) = \sqrt{x}$$

Step 2 $\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h}$

3 issues: $\frac{\infty}{\infty}$, $\frac{0}{0}$, and $\frac{\infty}{0}$

Step 3 $\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} \cdot \frac{\sqrt{x+h} + \sqrt{x}}{\sqrt{x+h} + \sqrt{x}}$

FOIL It!!

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

Step 4 $\lim_{h \rightarrow 0} \frac{h}{h(\sqrt{x+h} + \sqrt{x})} = \frac{1}{\sqrt{x+h} + \sqrt{x}}$

Step 5 $\lim_{h \rightarrow 0} \frac{1}{\sqrt{x} + \sqrt{x}} = \frac{1}{2\sqrt{x}} = f'(x)$

Step 6 Find $f'(4) = \frac{1}{2\sqrt{4}} = \frac{1}{4} = \text{slope of the tangent line @ } x=4$

Part B Step 7

equation of tangent line
 $m = \frac{1}{4}$

Find y-int when $x=0$

$$m = \frac{1}{4}, \text{ so } f(x) = \sqrt{x} \quad f(0) = \sqrt{0} = 0$$

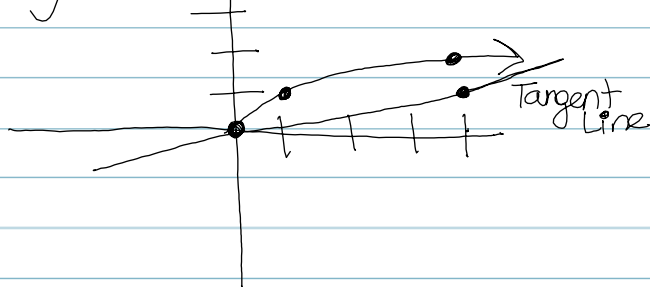
$(0, 0)$ data point

Step 8 Using $y = mx + b$ or $y - y_1 = m(x - x_1)$

, so $y = \frac{1}{4}x$

Part C Step 9 $f(x) = \sqrt{x}$

Finding tangent line



$(0, 0)$

$$y = \frac{1}{4}x$$

x	y
0	0
4	1