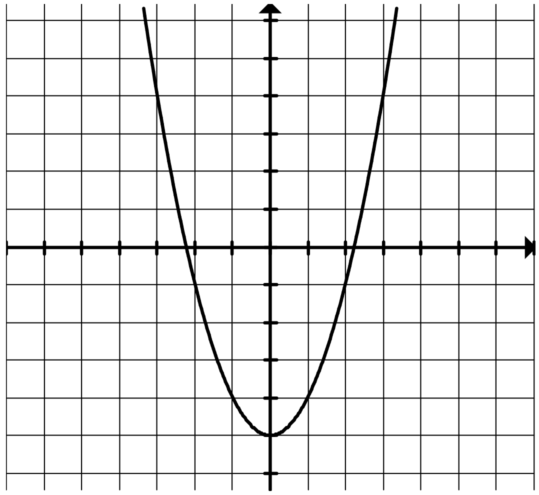
__Warmup 1.9__

1. Find the slope of the tangent to the curve $y = x^2 - 5$ at



a) $x = 3$

$$m_{tan} = \lim_{h \to 0} m_{sec}$$

$$= \lim_{h \to 0} \frac{f(3+h) - f(3)}{h}$$

$$= \lim_{h \to 0} \frac{9 + 6h + h^2 - 5 - 4}{h}$$

$$= \lim_{h \to 0} \frac{6h + h^2}{h}$$

$$= \lim_{h \to 0} 6 + h$$

$$m_{tan} = 6$$

b) $x = -3$

$m_{tan} = -6$

graph is symmetrical about $x = 0$

c) $x = 0$

$m_{tan} = 0$

at the vertex

d) $x = a$

$$m_{tan} = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

$$= \lim_{h \to 0} \frac{[(a+h)^2 - 5] - [a^2 - 5]}{h}$$

$$= \lim_{h \to 0} \frac{[a^2 + 2ah + h^2 - 5] - [a^2 - 5]}{h}$$

$$= \lim_{h \to 0} \frac{2ah + h^2}{h} \text{ or } \frac{\cancel{h}(2a+h)}{\cancel{h}}$$

$$\boxed{m_{tan} = 2a}$$

2. Find the slope of the tangent to the curve $f(x) = \sqrt{x}$ at $x = 9$

$$m_{tan} = \lim_{h \to 0} \frac{f(9+h) - f(9)}{h}$$

$$= \lim_{h \to 0} \frac{\sqrt{9+h} - \sqrt{9}}{h} \cdot \frac{\sqrt{9+h} + \sqrt{9}}{\sqrt{9+h} + \sqrt{9}}$$

$$= \lim_{h \to 0} \frac{9 + h - 9}{h(\sqrt{9+h} + \sqrt{9})}$$

$$= \lim_{h \to 0} \frac{\cancel{h}}{\cancel{h}(\sqrt{9+h} + \sqrt{9})} = \frac{1}{6}$$