

2.1 Limits Analytically

Practice #1

$$\lim_{x \rightarrow 3} (4x - 2) = 4(3) - 2$$
$$= \boxed{10}$$

Practice #2

$$\lim_{x \rightarrow 1} \frac{5x - 5}{x^2 - 1} \rightarrow \frac{5(1) - 5}{(1)^2 - 1} = \frac{0}{0} \therefore$$
$$= \lim_{x \rightarrow 1} \frac{5(x-1)}{(x-1)(x+1)}$$
$$= \lim_{x \rightarrow 1} \frac{5}{x+1}$$
$$= \frac{5}{1+1}$$
$$= \boxed{\frac{5}{2}}$$

Practice #3

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

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

$$= \lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 + 2 - 3x^2 - 2}{h}$$

$$= \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\cancel{h}(6x + 3h)}{\cancel{h}}$$

$$= \lim_{h \rightarrow 0} (6x + 3h)$$

$$= \boxed{6x}$$