2.1

Evaluate Limits Analytically

- Replace the value of c for x (if possible)

ex: $\lim_{x \to 2} 3x = 3(2) = \boxed{6}$

ex: $\lim_{x \to 2} 5 = \boxed{5}$

ex: $\lim_{x \to 2} x^2 = 2^2 = \boxed{4}$

ex: $\lim_{x \to 5} (x^2 - 3x + 2)$

$= \lim_{x \to 5} x^2 - \lim_{x \to 5} 3x + \lim_{x \to 5} 2$

$= 5^2 - 3(5) + 2$

$= 25 - 15 + 2$

$= \boxed{12}$

ex: $\lim_{x \to -1} \frac{x^2 + 3x + 2}{x + 1} \rightarrow \frac{(-1)^2 + 3(-1) + 2}{-1 + 1} = \frac{0}{0}$:(

$= \lim_{x \to -1} \frac{(x+2)\cancel{(x+1)}}{\cancel{x+1}}$

$= \lim_{x \to -1} (x+2)$

$= -1 + 2$

$= \boxed{1}$

ex: $\lim_{x \to 3} \frac{\sqrt{x+1} - 2}{x - 3} \rightarrow \frac{\sqrt{3+1} - 2}{3 - 3} = \frac{0}{0}$:(

$= \lim_{x \to 3} \frac{\sqrt{x+1} - 2}{x - 3} \cdot \frac{\sqrt{x+1} + 2}{\sqrt{x+1} + 2}$

$= \lim_{x \to 3} \frac{x + 1 - 4}{(x-3)(\sqrt{x+1} + 2)}$

$= \lim_{x \to 3} \frac{\cancel{x-3}}{\cancel{(x-3)}(\sqrt{x+1} + 2)}$

$= \lim_{x \to 3} \frac{1}{\sqrt{x+1} + 2}$

$= \frac{1}{\sqrt{3+1} + 2}$

$= \frac{1}{\sqrt{4} + 2}$

$= \frac{1}{2+2}$

$= \boxed{\frac{1}{4}}$

ex: $\lim_{h \to 0} \frac{(x+h)^2 - x^2}{h} \rightarrow \frac{(x+0)^2 - x^2}{0} = \frac{0}{0}$:(

$= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 - x^2}{h}$

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

$= \lim_{h \to 0} \frac{\cancel{h}(2x+h)}{\cancel{h}}$

$= \lim_{h \to 0} (2x + h)$

$= \boxed{2x}$