

Ch 11 Limits

1)
a) $\lim_{x \rightarrow -2} \frac{x^2 - 1}{2x} = \frac{4 - 1}{-4} = \left(-\frac{3}{4} \right)$

b) $\lim_{x \rightarrow -1} \frac{2x^2 - x - 3}{x + 1} = \frac{(2x - 3)(x + 1)}{x + 1} = \left(-7 \right)$

c) $\lim_{x \rightarrow 5} \frac{\sqrt{x} - 2}{x - 5} \cdot \frac{(\sqrt{x} + 2)}{(\sqrt{x} + 2)} = \frac{x - 4}{(x - 5)(\sqrt{x} + 2)} = \text{DNE}$

2)
a) $\frac{3(x+h)^2 - 5(x+h) - 2 - 3x^2 + 5x + 2}{h} =$

$$\frac{\cancel{3x^2} + 6xh + 3h^2 - \cancel{5x} - 5h - \cancel{2} - \cancel{3x^2} + \cancel{5x} + \cancel{2}}{h}$$

$$\lim_{h \rightarrow 0} \frac{h(6x + 3h - 5)}{h} = \left(6x - 5 \right)$$

$$6(2) - 5 = \left(7 \right)$$

b) $\frac{2(x+h)^3 + 6(x+h) - 2x^3 - 6x}{h}$

$$\frac{\cancel{2x^3} + 6x^2h + 2xh^2 + \cancel{6x} + 6h - \cancel{2x^3} - \cancel{6x}}{h}$$

$$\lim_{h \rightarrow 0} \frac{h(6x^2 + 2xh + 6)}{h} = \boxed{6x^2 + 6}$$

$$= 6(-1)^2 + 6 = \left(12 \right)$$

$$3) \frac{4 - \frac{3(x+h)}{4} - 4 + \frac{3}{4}x}{h}$$

$$\frac{4 - \frac{3}{4}x - \frac{3}{4}h - 4 + \frac{3}{4}x}{h} = \left(-\frac{3}{4}\right)$$

$$b) \frac{2(x+h)^2 + 4(x+h) - 1 - 2x^2 - 4x + 1}{h}$$

$$\frac{2x^2 + 4xh + 2h^2 + 4x + 4h - 1 - 2x^2 - 4x + 1}{h}$$

$$\lim_{h \rightarrow 0} \frac{h(4x + 2h + 4)}{h} = (4x + 4)$$

$$c) \frac{\frac{1}{x+h+3} - \frac{1}{x+3}}{h} = \frac{x+3 - x-h-3}{(x+h+3)(x+3)} \cdot \frac{1}{h}$$

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

$$4) a) \lim_{x \rightarrow \infty} \frac{6}{5x-1} = (0)$$

$$b) \lim_{x \rightarrow \infty} \frac{1-3x^2}{x^2-5} = (-3)$$

$$c) \lim_{x \rightarrow \infty} \frac{3x^3}{x+2} = \frac{\lim_{x \rightarrow \infty} 3x^3}{\lim_{x \rightarrow \infty} x+2} = \frac{\infty}{\infty} = \infty$$

$$5) a) \frac{2}{3}, 1, \frac{8}{7}, \frac{11}{9}, \frac{14}{11} \quad \lim_{x \rightarrow \infty} \frac{3n-1}{2n+1} = \left(\frac{3}{2} \right)$$

$$b) \frac{1}{2n^2} (3 - 2n^2 - 2n) = \frac{-2n^2 - 2n + 3}{2n^2}$$

$$-\frac{1}{2}, -\frac{9}{8}, -\frac{21}{18}, -\frac{37}{5}, -\frac{81}{72} \quad \lim_{x \rightarrow \infty} = (-1)$$

$$c) \frac{1}{2}, \frac{2}{5}, \frac{3}{10}, \frac{4}{17}, \frac{5}{26} \quad \lim_{n \rightarrow \infty} = (0)$$

d) X