

Lesson 4 Homework

1) a) $\lim_{x \rightarrow 6} \frac{x^2 - 36}{x^2 - x - 30} = \left(\frac{0}{0}\right) =$

$= \lim_{x \rightarrow 6} \frac{(x-6)(x+6)}{(x-6)(x+5)} = \lim_{x \rightarrow 6} \frac{x+6}{x+5} = \frac{6+6}{6+5} = \frac{12}{11}$

$$\begin{array}{r|l} x^2 - x - 30 & x - 6 \\ -x^2 - 6x & \hline 5x - 30 & \\ 5x - 30 & \\ \hline 0 & \end{array} \quad \begin{array}{l} x - 6 \\ \hline x + 5 \end{array}$$

b) $\lim_{x \rightarrow 7} \frac{x^2 - 49}{x^2 - 13x + 42} = \left(\frac{0}{0}\right) = \lim_{x \rightarrow 7} \frac{(x-7)(x+7)}{(x-7)(x+6)} =$

$$\begin{array}{r|l} x^2 - 13x + 42 & x - 7 \\ -x^2 - 7x & \hline 6x + 42 & \\ 6x - 42 & \\ \hline 0 & \end{array} \quad \begin{array}{l} x - 7 \\ \hline x + 6 \end{array}$$

$= \lim_{x \rightarrow 7} \frac{x+7}{x+6} = \frac{14}{13}$

$$2) \lim_{x \rightarrow 0} \frac{3x + \sin 4x}{1 - \cos 4x} = \left(\frac{0}{0} \right) = \frac{3x \cdot 4x}{1 - 4x} =$$

$$= \lim_{x \rightarrow 0} \frac{12x^2}{1 - 4x} = 2$$

$$c) \lim_{x \rightarrow \infty} \left(\frac{4x}{4x+3} \right)^{\frac{5x^2}{7x-1}} = (1)^{+\infty} =$$

$$\lim_{x \rightarrow \infty} \left(\frac{4x - 3 + 3}{4x - 3} \right)^{\frac{5x^2}{7x-1}} =$$

$$\lim_{x \rightarrow \infty} \left(1 + \frac{3}{4x-3} \right)^{\frac{4x-3}{3} \cdot \frac{3}{4x-3} \cdot \frac{5x^2}{7x-1}} =$$

$$\lim_{x \rightarrow \infty} e^{\frac{15x^2}{(4x-3)(7x-1)}} = e^{\frac{15x^2}{28x^2 - 4x - 21x + 3}} =$$

$$= \lim_{x \rightarrow \infty} e^{\frac{15x^2}{28x^2 - 25x + 3}} = \lim_{x \rightarrow \infty} e^{\frac{15}{28}} =$$