

Worksheet 3a Limits)

1. Find each of the following limits if they exist. If they do not exist, give reasons for your answers.

a. $\lim_{x \rightarrow \infty} \left(\frac{-3x^2 + x - 6}{x^2 + 3x - 10} \right) = -3$ b. $\lim_{x \rightarrow \infty} \left(\frac{7 - 3x^2 - 6x^3}{4x^2 + 3x - 10} \right)$
 $= -\infty$

c. $\lim_{x \rightarrow \infty} \left(\frac{1}{x} + 1 \right) \left(\frac{5x^2 - 7}{x^2} \right)$ d. $\lim_{x \rightarrow \infty} \left(\frac{x^2 + x - 6}{4x^3 + 3x - 10} \right)$
 $= 5$ $= 0$

e. $\lim_{x \rightarrow -\infty} \left(\frac{3x^2 + x - 7}{-5x^2 - 4x + 10} \right)$ f. $\lim_{x \rightarrow \infty} \left(\frac{3x^3 + 5x^2 - 7}{10x^3 - 11x + 5} \right)$
 $= -\frac{3}{5}$ $= \frac{3}{10}$

g. $\lim_{x \rightarrow -\infty} |x| = \infty$ h. $\lim_{x \rightarrow \infty} \left(\frac{|x|}{|x| + 1} \right) = 1$

i. $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 1} - x) = 0$ j. $\lim_{x \rightarrow \infty} (\sqrt{3x^2 + 8x + 6} - \sqrt{3x^2 + 3x + 1})$
 $= \frac{5}{2\sqrt{3}}$

k. $\lim_{x \rightarrow \infty} \left(\sqrt{\frac{12x^3 - 5x + 2}{1 + 4x^2 + 3x^3}} \right)$ l. $\lim_{x \rightarrow \infty} \left(\frac{9 - 7x - 8x^3}{10 - 3x - 9x^2} \right)$
 $= 2$ $= -\infty$

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m.
$$\lim_{x \rightarrow \infty} \left(\frac{4x^4 - 9x}{5x - 7x^2 - 11x^4 - 1} \right)$$
$$= -\frac{4}{11}$$

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

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

p.
$$\lim_{x \rightarrow \infty} \left(\frac{x\sqrt{x}}{\sqrt{5 + x^3}} \right) = 1$$

$$\lim_{x \rightarrow -\infty} \left(\frac{x\sqrt{x}}{\sqrt{5 + x^3}} \right)$$

q.
$$\left(\frac{x\sqrt{x}}{\sqrt{5 + x^3}} \right) \text{ is not defined for negative values of } x$$

Consequently the limit does not exist.

r.
$$\lim_{x \rightarrow \infty} \left(\sqrt{3x^2 + 8x + 6} - \sqrt{4x^2 + 3x + 1} \right)$$
$$= -\infty$$