

EXERCISE 10G

LIMITS AT INFINITY

1. Evaluate the following limits:

(a) $\lim_{x \rightarrow \infty} \frac{3}{x}$	(b) $\lim_{x \rightarrow \infty} \frac{5}{x+6}$	(c) $\lim_{x \rightarrow \infty} (3x-2)$
(d) $\lim_{x \rightarrow \infty} \left(5 + \frac{2}{3x-1}\right)$	(e) $\lim_{x \rightarrow \infty} \frac{2x}{x+2}$	(f) $\lim_{x \rightarrow \infty} \frac{2x^2}{5x^2+1}$
(g) $\lim_{x \rightarrow \infty} \frac{5x^2-4x}{3x^3+2}$	(h) $\lim_{x \rightarrow \infty} \frac{9x^3-5x^2}{3x^2-2x-1}$	(i) $\lim_{x \rightarrow \infty} \frac{px+q}{mx+n}$
(j) $\lim_{x \rightarrow \infty} \frac{ax^2+bx+c}{(px+q)^2}$	(k) $\lim_{x \rightarrow \infty} \frac{x^3(x-6)}{5x^4-11x}$	

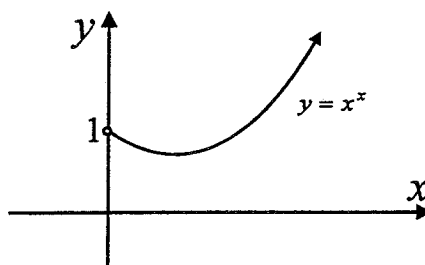
2. Describe the geometric meaning of your answers in question 1 (f), (g), (h).

3. Evaluate the following limits:

(a) $\lim_{x \rightarrow -\infty} \frac{6x+1}{x^2+1}$	(b) $\lim_{x \rightarrow -\infty} \frac{x^2+4}{3x^2+7}$	(c) $\lim_{x \rightarrow -\infty} \frac{x^3+5x}{3x^2-1}$
(d) $\lim_{x \rightarrow -\infty} \frac{ x-3 }{x-3}$	(e) $\lim_{x \rightarrow -\infty} \frac{(x-2)(x^2+3)}{7x^3-2}$	(f) $\lim_{x \rightarrow -\infty} \left(x + \frac{5}{x+10}\right)$

4. This is a graph of the function
 $y = x^x \quad (x > 0)$

Use the graph to find $\lim_{x \rightarrow +\infty} x^x$

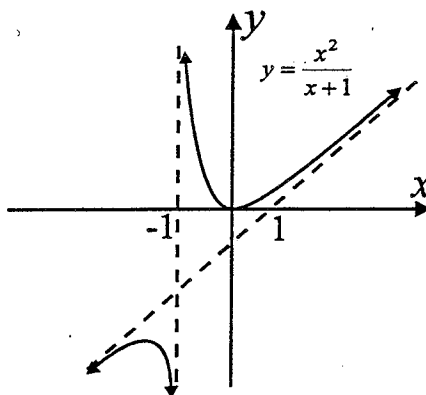


5. This is a graph of the function

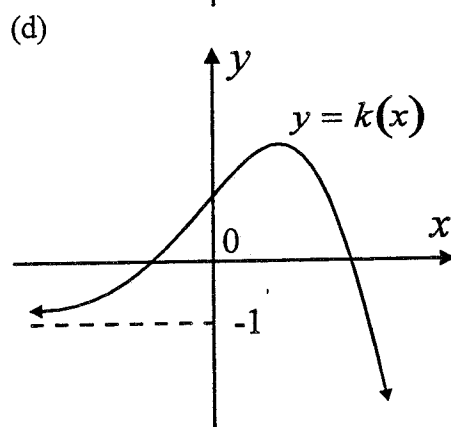
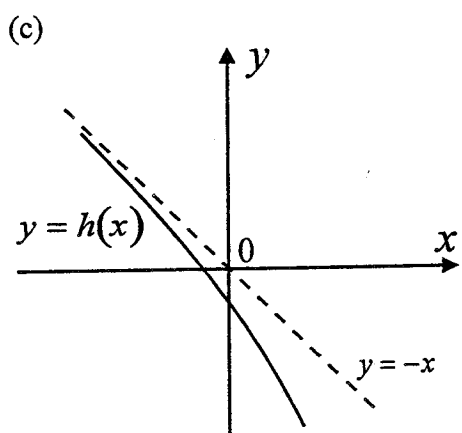
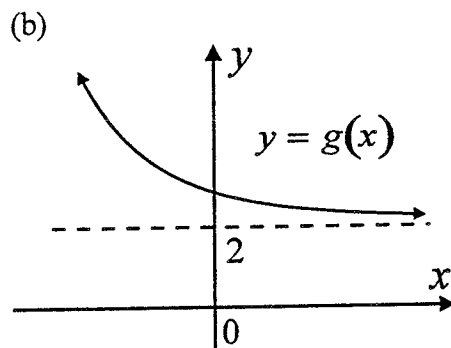
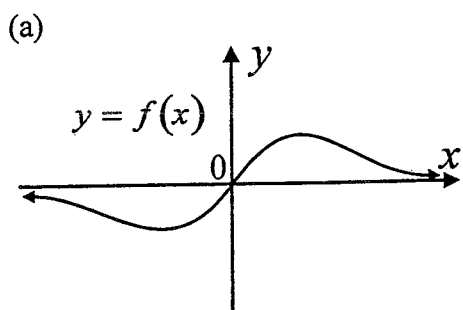
$$y = \frac{x^2}{x+1}$$

Use the graph to find:

(a)	$\lim_{x \rightarrow +\infty} f(x)$
(b)	$\lim_{x \rightarrow -\infty} f(x)$
(c)	$\lim_{x \rightarrow -1} f(x)$



6. For each of the following functions find (i) $\lim_{x \rightarrow +\infty} y$ and (ii) $\lim_{x \rightarrow -\infty} y$



ANSWERS

1. (a) 0 (b) 0 (c) does not exist (d) 5 (e) 2 (f) $\frac{2}{5}$ (g) 0
 (h) does not exist (i) $\frac{p}{m}$ (j) $\frac{a}{p^2}$ (k) $\frac{1}{5}$
2. (f) Horizontal asymptote $y = \frac{2}{5}$ (g) Horizontal asymptote $y = 0$ i.e. x-axis
 (h) no horizontal asymptote. Oblique asymptote: $y = 3x + \frac{1}{3}$.
3. (a) 0 (b) $\frac{1}{3}$ (c) does not exist (d) -1 (e) $\frac{1}{7}$ (f) does not exist
4. does not exist
5. (a) does not exist (b) does not exist (c) does not exist
6. (a) 0, 0 (b) 2, does not exist (c) does not exist, does not exist
 (d) does not exist, -1