

FINDING LIMITS

To evaluate $\lim_{x \rightarrow a} f(x)$ or $\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$

First: substitute the value $x=a$ into the function {ie. find $f(a)$ or $\frac{f(a)}{g(a)}$ }

Then:- If you get a finite answer, Stop!

If you get ∞ , there is No limit! (or $\frac{1}{0}$)

If you get $\frac{0}{0}$, factorise and then try substituting again.

If you get $\frac{\infty}{\infty}$, divide through by the highest power of x ;

and remember $\lim_{x \rightarrow \infty} \frac{1}{x^n} = 0$

Exercises:-

Quest (1) As $x \rightarrow \infty$ what happens to...

(i) $\frac{1}{4x} \rightarrow ?$ (ii) $\frac{x}{x^2+1} \rightarrow ?$ (iii) $4x^2 \rightarrow ?$ (iv) $\frac{x}{x+1} \rightarrow ?$

Quest (2) As $x \rightarrow 0$ what happens to...

(i) $\frac{4-x}{x+1} \rightarrow ?$ (ii) $\frac{x}{x+2} \rightarrow ?$ (iii) $\frac{2}{x} \rightarrow ?$ (iv) $\frac{-1}{x} \rightarrow ?$

Quest (3) Find the following limits:-

(i) $\lim_{x \rightarrow \infty} 4 - \frac{1}{x}$ (ii) $\lim_{x \rightarrow 3} \frac{5x^2 - 15x}{x - 3}$ (iii) $\lim_{x \rightarrow 3} \frac{x^2 + 3x}{x + 3}$

(i) $\lim_{x \rightarrow \infty} \frac{3x-1}{x}$ (ii) $\lim_{x \rightarrow 5} \frac{x^2-25}{x^2-5x}$ (iii) $\lim_{x \rightarrow 3} \frac{x+1}{x^2-1}$

ANSWERS

$\frac{1}{4}$ (i) ∞ (ii) ∞ (iii) ∞ (iv) $\frac{1}{2}$ (i) $\frac{3}{2}$ (ii) $\frac{1}{2}$ (iii) $\frac{1}{2}$ (iv) $\frac{1}{2}$
 ∞ (i) ∞ (ii) ∞ (iii) ∞ (iv) ∞ (v) ∞ (vi) ∞ (vii) ∞ (viii) ∞ (ix) ∞ (x) ∞

LESSON 37 - HW

Qu ① If $f(x) = 2x^2 + 1$

(i) Find $f(5) =$

(ii) Find $f(r+1) =$

(iii) Find $f(x+h) =$

(iv) Show that: $f(x+h) - f(x) = 2h(2x+h)$

(v) Hence find: $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

Qu ②

Find the "gradient formula" for the following graphs.

(i) $y = x^3$

(ii) $y = 6x^2$

(iii) $y = x^4 - 3x^2$

(iv) $y = 8x^2$

(v) $y = 5x^3 + 8x$

(vi) $y = x^2 - 5x + 4$

ANSWERS

5- x^2 (i) 8+ x^2 (ii) 8 (iii) $x^3 - 6x$ (iv) $12x^2$ (v) $3x^2$ (vi) $2x$

(vii) $3x^2 - 5$ (viii) $3x^2 - 5$ (ix) $3x^2 - 5$ (x) $3x^2 - 5$