Find limit
- Graph method
- Direct substitution method

Direct substitution method

Find limit → Substitute value of x

- Determinate Form (means got a real number) → Answer #.
- 3 types of Indeterminate Form
  1. $\frac{0}{0}$ → Factorise & cancel off; → Multiply conjugate (Surd)
  2. $\frac{\infty}{\infty}$ → Divide all terms by highest power of x (at denominator)
  3. $\infty - \infty$ → Multiply conjugate (Surd)

CONTINUITY

If $\lim_{x\to a^-} f(x) = L$, $\lim_{x\to a^+} f(x) = L$

$\Rightarrow \lim_{x\to a} f(x) = L$.

$\Rightarrow \lim_{x\to a} f(x)$ exist.

If $\lim_{x\to a^-} f(x) = M$, $\lim_{x\to a^+} f(x) = L$

$\Rightarrow \lim_{x\to a^-} f(x) \neq \lim_{x\to a^+} f(x)$

$\Rightarrow \lim_{x\to a} f(x)$ doesn't exist.

Vertical Asymptote

$\lim_{x\to a^+} f(x) = \pm\infty$ OR $\lim_{x\to a^-} f(x) = \pm\infty$

$\therefore$ $x=a$ is V.A.

Horizontal Asymptote

$\lim_{x\to +\infty} f(x) = b$ OR $\lim_{x\to -\infty} f(x) = b$

$\therefore$ $y=b$ is H.A.

Discuss the continuity of f at $x=a$.

(i) $f(a)$ defined.

(ii) $\lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x)$ ($\lim_{x\to a} f(x)$ exist.)

(iii) $f(a) = \lim_{x\to a} f(x)$

$\therefore$ f is continuous at $x=a$.

Given that f is continuous at $x=a$.

$f(a) = \lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x)$