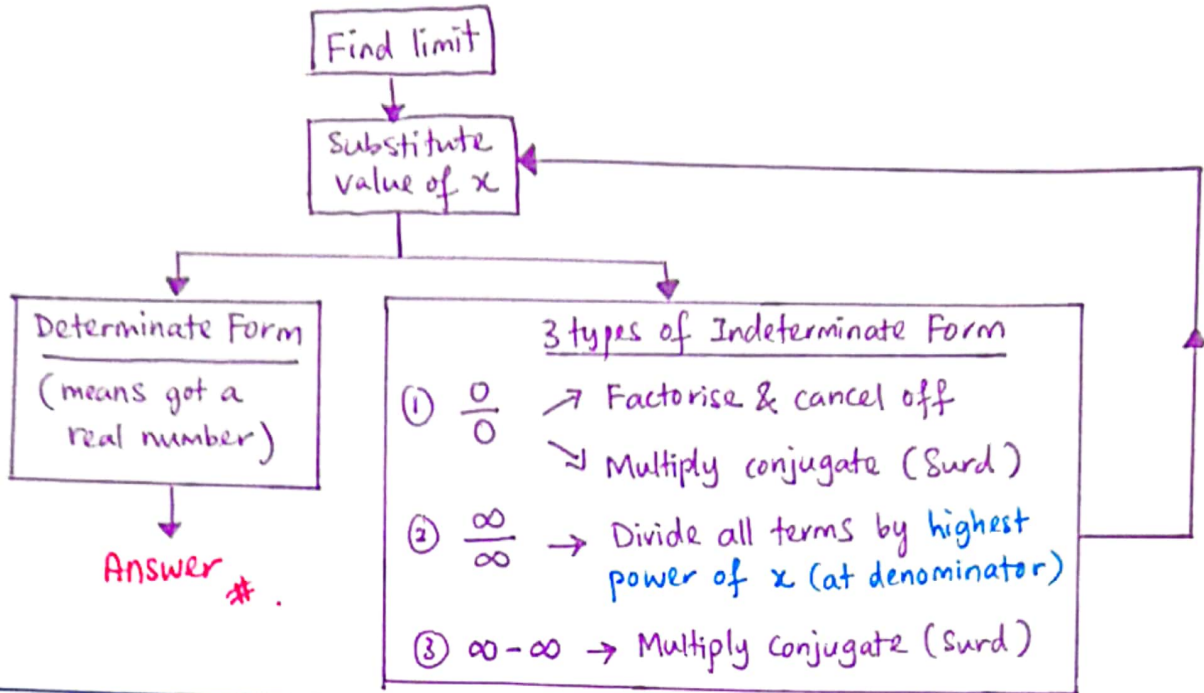


Direct substitution method



CONTINUITY

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

⇒ $\lim_{x \rightarrow a} f(x) = L$.

⇒ $\lim_{x \rightarrow a} f(x)$ exist.

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

⇒ $\lim_{x \rightarrow a^-} f(x) \neq \lim_{x \rightarrow a^+} f(x)$

⇒ $\lim_{x \rightarrow a} f(x)$ doesn't exist.

Vertical Asymptote

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

∴ $x=a$ is V.A.

Horizontal Asymptote

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

∴ $y=b$ is H.A.

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

(i) $f(a)$ defined.

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

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

∴ f is continuous at $x=a$.

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

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