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or $\frac{\infty}{\infty}$.

Note:

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Exam

Since

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Since

Example

Since $\lim_{x \rightarrow 0} \frac{1}{x} = \infty$

Example

Since $\lim_{x \rightarrow 0} \frac{1}{x^2} = \infty$

Example

Since $\lim_{x \rightarrow 0} \frac{1}{x^3} = \infty$

Example

Since $\lim_{x \rightarrow 0} \frac{1}{x^4} = \infty$

The limit of

Other types of indeter

In the event that the limit
convert it into an indeterm

$$f(x)g(x) = \frac{f(x)}{\frac{1}{g(x)}} \text{ or } f(x)$$

Example 7 Find $\lim_{x \rightarrow 0^+} x \ln x$

Since $\lim_{x \rightarrow 0^+} x = 0$ and
must first convert this prod

Using l'Hôpital's Rule, we h

Example 8 Find $\lim_{x \rightarrow \infty} x \tan^{-1} x$

Since $\lim_{x \rightarrow \infty} x = \infty$ and
can easily convert it into th
l'Hôpital's Rule, we have:

$$\lim_{x \rightarrow \infty} x \tan^{-1} x$$

Example 9 Find $\lim_{x \rightarrow \infty} x^3 e^{-x}$

It is not difficult to see that
into the quotient $\lim_{x \rightarrow \infty} \frac{x^3}{e^x}$
we obtain:

$$\lim_{x \rightarrow \infty} x^3 e^{-x}$$

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Example 13 Find $\lim_{x \rightarrow 1} \left(\frac{x}{x-1} - \frac{1}{\ln x} \right)$

Since $\lim_{x \rightarrow 1} \frac{x}{x-1} = \infty$ and $\lim_{x \rightarrow 1} \frac{1}{\ln x} = \infty$, we must first convert this using a

$$\lim_{x \rightarrow 1} \left(\frac{x}{x-1} - \frac{1}{\ln x} \right)$$

Since $\lim_{x \rightarrow 1} (x \ln x - x + 1) = 0$ and $\lim_{x \rightarrow 1} (x-1) = 0$, we have an indeterminate form of type $\frac{0}{0}$. We can therefore apply L'Hôpital's rule.

$$\lim_{x \rightarrow 1} \left(\frac{x \ln x - x + 1}{x-1} \right) =$$

Since the limits of both the numerator and denominator are 0, we can apply L'Hôpital's rule.

$$\lim_{x \rightarrow 1} \left(\frac{x \ln x - x + 1}{x-1} \right) =$$

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SOLU

1. $\lim_{x \rightarrow 0} \frac{1}{x}$

=

2. $\lim_{x \rightarrow 0} \frac{1}{x^2}$

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=

3. $\lim_{x \rightarrow 0} \frac{1}{x^3}$

=

=

4. $\lim_{x \rightarrow 0} \frac{1}{x^4}$

=

5. $\lim_{x \rightarrow 0} \frac{1}{x^5}$

=

6. $\lim_{x \rightarrow 0} \frac{1}{x^6}$

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=

13.

14.

15.

16.

$$21. \lim_{x \rightarrow \infty} \frac{\ln(x-10)}{\ln(4x+1)} \quad (\text{type } \frac{\infty}{\infty})$$

$$= \lim_{x \rightarrow \infty} \frac{\left[\frac{1}{x-10} \right]}{\left[\frac{4}{4x+1} \right]}$$

$$= \lim_{x \rightarrow \infty} \frac{4x+1}{4x-40} \quad (\text{type } \frac{\infty}{\infty})$$

$$= \lim_{x \rightarrow \infty} \frac{4}{4} = \frac{4}{4} = 1$$

$$22. \lim_{x \rightarrow 0^+} \frac{\sqrt{x}}{\ln(x+1)} \quad (\text{type } \frac{0}{0})$$

$$= \lim_{x \rightarrow 0^+} \frac{\left[\frac{1}{2\sqrt{x}} \right]}{\left[\frac{1}{x+1} \right]}$$

$$= \lim_{x \rightarrow 0^+} \frac{x+1}{2\sqrt{x}} = \infty$$

$$23. \lim_{x \rightarrow \infty} \frac{e^{4x}}{e^{3x} + x} \quad (\text{type } \frac{\infty}{\infty})$$

$$= \lim_{x \rightarrow \infty} \frac{4e^{4x}}{3e^{3x} + 1} \quad (\text{type } \frac{\infty}{\infty})$$

$$= \lim_{x \rightarrow \infty} \frac{16e^{4x}}{9e^{3x}} = \lim_{x \rightarrow \infty} \frac{16e^x}{9} = \infty$$

$$24. \lim_{x \rightarrow 0} \frac{e^{2x} - 1}{e^{5x} - 1} \quad (\text{type } \frac{0}{0})$$

$$= \lim_{x \rightarrow 0} \frac{2e^{2x}}{5e^{5x}} = \lim_{x \rightarrow 0} \frac{2}{5e^{3x}} = \frac{2}{5}$$

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26. lim

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27. lim

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28. lim

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$$29. \lim_{x \rightarrow 0^+} \left(\frac{1}{x} \right)$$

$$= \lim_{x \rightarrow 0^+}$$

$$= \lim_{x \rightarrow 0^+}$$

$$= \lim_{x \rightarrow 0^+}$$

$$= \lim_{x \rightarrow 0^+}$$

$$= \lim_{x \rightarrow 0^+}$$

$$30. \lim_{x \rightarrow \infty} (\sqrt{x})$$

$$= \lim_{x \rightarrow \infty} \sqrt{x}$$