Indeterminate form:

$\underbrace{\frac{0}{0}, \frac{\infty}{\infty}}$ $\underbrace{0\cdot\infty, \infty-\infty}$, $\underbrace{0^0, 1^\infty, \infty^0}$

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$\left(\frac{0}{0}\right)$ 1. Calculate the limit $\lim_{x\to 0} \frac{e^x - 1}{10\ln(1+x)}$. $\overset{\left(\frac{0}{0}\right)}{\underset{L'}{=}} \lim_{x\to 0} \frac{e^x}{\frac{10}{1+x}} = \frac{1}{10}$

(X) 2. Calculate the limit $\lim_{x\to 0} \frac{4x - \sin(\pi x)}{2x^2 - 1}$. $= \frac{0}{-1} = 0$

$\frac{4x - \sin(\pi x)}{2x^2 - 1}$ is NOT one of the indeterminate form.

$\left(\frac{\infty}{\infty}\right)$ 3. Calculate the limit $\lim_{x\to\infty} \frac{\ln(x^7)}{x}$. $\overset{\left(\frac{\infty}{\infty}\right)}{\underset{L'}{=}} \lim_{x\to\infty} \frac{\frac{7x^6}{x^7}}{1} = \lim_{x\to\infty} \frac{7}{x} = 0$

(1^∞) 4. Calculate the limit $\lim_{x\to 1} x^{\left(\frac{8}{x-1}\right)}$. $= \lim_{x\to 1} e^{\ln x^{\left(\frac{8}{x-1}\right)}} = \lim_{x\to 1} e^{\frac{8}{x-1}\cdot\ln(x)}$

Since $\lim_{x\to 1} \frac{8\ln x}{x-1} \overset{\left(\frac{0}{0}\right)}{\underset{L'}{=}} \lim_{x\to 1} \frac{\frac{8}{x}}{1} = 8$

and e^x is a continuous function

$= e^{\lim_{x\to 1} \frac{8\ln(x)}{x-1}} = e^8$

$(\infty-\infty)$ 5. Calculate the limit $\lim_{x\to 0}\left(\frac{8}{x} - 8\cot(x)\right)$. $\overset{(\infty-\infty)}{=} \lim_{x\to 0}\left(\frac{8\sin(x) - 8x\cos(x)}{x\sin(x)}\right)$

$8\cdot\frac{\cos(x)}{\sin(x)}$

$\overset{\left(\frac{0}{0}\right)}{\underset{L'}{=}} \lim_{x\to 0} \frac{8\cos(x) - 8\cos(x) + 8x\sin(x)}{\sin(x) + x\cos(x)}$

$\overset{\left(\frac{0}{0}\right)}{\underset{L'}{=}} \lim_{x\to 0} \frac{8\sin(x) + 8x\cos(x)}{\cos(x) + \cos(x) - x\sin(x)} = \frac{0}{2} = 0$

(∞^0) 6. Calculate the limit $\lim_{x\to\infty} (x^6+1)^{\frac{1}{\ln(x)}}$. $= \lim_{x\to\infty} e^{\ln(x^6+1)^{\frac{1}{\ln(x)}}}$

$= \lim_{x\to\infty} e^{\frac{1}{\ln(x)}\ln(x^6+1)}$

Since $\lim_{x\to\infty} \frac{\ln(x^6+1)}{\ln(x)} \overset{\left(\frac{\infty}{\infty}\right)}{\underset{L'}{=}} \lim_{x\to\infty} \frac{\frac{6x^5}{x^6+1}}{\frac{1}{x}}$

$= \lim_{x\to\infty} \frac{6x^6}{x^6+1} = 6$

leading coef.

and e^x is a continuous function

$= e^{\lim_{x\to\infty} \frac{\ln(x^6+1)}{\ln(x)}} = e^6$