In[24]:= **limit as n goes to infinity of (2^2^(n+1)) / (2^2^n))**

An attempt was made to fix mismatched delimiters

Limit:

Show steps

$$\lim_{n\to\infty} \frac{2^{2^{n+1}}}{2^{2^n}} = \infty$$

WolframAlpha

In[25]:= **lim n -> inf of (2^2^n)/((n+1)!)**

Limit:

Show steps

$$\lim_{n\to\infty} \frac{2^{2^n}}{(n+1)!} = \infty$$

$n!$ is the factorial function »

Series expansion at n=∞:

More terms

$$2^{2^n}\left(\frac{\left(\frac{1}{n}\right)^{3/2}}{\sqrt{2\pi}} - \frac{13\left(\frac{1}{n}\right)^{5/2}}{12\sqrt{2\pi}} + \frac{313\left(\frac{1}{n}\right)^{7/2}}{288\sqrt{2\pi}} - \frac{56\,201\left(\frac{1}{n}\right)^{9/2}}{51\,840\sqrt{2\pi}} + O\left(\left(\frac{1}{n}\right)^{11/2}\right)\right)\exp\left(\left(\log\left(\frac{1}{n}\right)+1\right)n + O\left(\left(\frac{1}{n}\right)^{6}\right)\right)$$

$\log(x)$ is the natural logarithm »

WolframAlpha

In[26]:= **lim n -> inf (n+1)! / n!**

Limit:

Show steps

$$\lim_{n\to\infty} \frac{(n+1)!}{n!} = \infty$$

$n!$ is the factorial function »

WolframAlpha

In[27]:= **lim n->inf n! / e^n**

Limit:

Show steps

$$\lim_{n\to\infty} \frac{n!}{e^n} = \infty$$

n ! is the factorial function »

Series expansion at n=∞:

More terms

$$\left(\sqrt{2\pi}\,\sqrt{n} + \frac{1}{6}\sqrt{\frac{\pi}{2}}\sqrt{\frac{1}{n}} + \frac{1}{144}\sqrt{\frac{\pi}{2}}\left(\frac{1}{n}\right)^{3/2} - \frac{139\sqrt{\frac{\pi}{2}}\left(\frac{1}{n}\right)^{5/2}}{25\,920} - \frac{571\sqrt{\frac{\pi}{2}}\left(\frac{1}{n}\right)^{7/2}}{1\,244\,160} + \frac{163\,879\sqrt{\frac{\pi}{2}}\left(\frac{1}{n}\right)^{9/2}}{104\,509\,440} + O\left(\left(\frac{1}{n}\right)^{11/2}\right)\right) \exp\left(\left(-\log\left(\frac{1}{n}\right) - 2\right) n + O\left(\left(\frac{1}{n}\right)^{6}\right)\right)$$

log(x) is the natural logarithm »

WolframAlpha

In[29]:= **lim n->inf e^n / (n*2^n)**

Limit:

Show steps

$$\lim_{n\to\infty} \frac{e^n}{n\,2^n} = \infty$$

WolframAlpha

In[30]:= **lim n->inf (n*2^n) / 2^n**

Limit:

Show steps

$$\lim_{n\to\infty} \frac{n\,2^n}{2^n} = \infty$$

Series expansion at n=∞:

More terms

$$n + O\left(\left(\frac{1}{n}\right)^{6}\right)$$

WolframAlpha

In[31]:= **lim n->inf (2^n) / (3/2)^n**

Limit:

Show steps

$$\lim_{n\to\infty} \frac{2^n}{\left(\frac{3}{2}\right)^n} = \infty$$

WolframAlpha

In[32]:= **lim n->inf (3/2)^n / (n^(log(log(n))))**

Assuming "log" is the natural logarithm | Use the base 10 logarithm instead

Limit:

Show steps

$$\lim_{n\to\infty} \frac{\left(\frac{3}{2}\right)^n}{n^{\log(\log(n))}} = \infty$$

log(x) is the natural logarithm »

WolframAlpha

In[33]:= lim n->inf (n^(log(log(n))) / (log(n))!

An attempt was made to fix mismatched delimiters

Assuming "log" is the natural logarithm | Use the base 10 logarithm instead

Limit:

Show steps

$$\lim_{n\to\infty} \frac{n^{\log(\log(n))}}{\log(n)!} = \infty$$

$\log(x)$ is the natural logarithm »

$n!$ is the factorial function »

Series expansion at $n=\infty$:

More terms

$$\left(\frac{1}{\sqrt{2\pi}} + O\left(\left(\frac{1}{n}\right)^6\right)\right)$$
$$\exp\left(\left(-\log\left(-\log\left(\frac{1}{n}\right)\right)\log\left(\frac{1}{n}\right) - \log\left(\frac{1}{n}\right) - \left(\frac{1}{2} - \log\left(\frac{1}{n}\right)\right)\log\left(1-\log\left(\frac{1}{n}\right)\right) - \frac{1}{12\left(1-\log\left(\frac{1}{n}\right)\right)} + \frac{1}{360\left(1-\log\left(\frac{1}{n}\right)\right)^3} - \frac{1}{1260\left(1-\log\left(\frac{1}{n}\right)\right)^5} + \frac{1}{1680\left(1-\log\left(\frac{1}{n}\right)\right)^7} - \frac{1}{1188\left(1-\log\left(\frac{1}{n}\right)\right)^9} + \frac{691}{360360\left(1-\log\left(\frac{1}{n}\right)\right)^{11}} + 1\right) + O\left(\left(\frac{1}{n}\right)^6\right)\right)$$

WolframAlpha

In[34]:= **lim n->inf (log(n)!) / n^3**

Assuming “log” is the natural logarithm | Use the base 10 logarithm instead

Limit:

Show steps

$$\lim_{n\to\infty} \frac{\log(n)!}{n^3} = \infty$$

log(x) is the natural logarithm »

n ! is the factorial function »

Series expansion at n=∞:

More terms

$$\left(\frac{\sqrt{2\pi}}{n^3} + O\left(\left(\frac{1}{n}\right)^6\right)\right)$$

$$\exp\left(\left(\log\left(\frac{1}{n}\right) + \left(\frac{1}{2} - \log\left(\frac{1}{n}\right)\right)\log\left(1 - \log\left(\frac{1}{n}\right)\right) + \frac{1}{12\left(1-\log\left(\frac{1}{n}\right)\right)} - \frac{1}{360\left(1-\log\left(\frac{1}{n}\right)\right)^3} + \frac{1}{1260\left(1-\log\left(\frac{1}{n}\right)\right)^5} - \right.\right.$$

$$\left.\left.\frac{1}{1680\left(1-\log\left(\frac{1}{n}\right)\right)^7} + \frac{1}{1188\left(1-\log\left(\frac{1}{n}\right)\right)^9} - \frac{691}{360\,360\left(1-\log\left(\frac{1}{n}\right)\right)^{11}} - 1\right) + O\left(\left(\frac{1}{n}\right)^6\right)\right)$$

WolframAlpha

In[35]:= **lim n->inf n^2 / (log(n!))**

Assuming “log” is the natural logarithm | Use the base 10 logarithm instead

Limit:

Show steps

$$\lim_{n\to\infty} \frac{n^2}{\log(n!)} = \infty$$

n ! is the factorial function »

log(x) is the natural logarithm »

Series expansion at n=∞:

More terms

$$\frac{n}{\log(n)-1} + \frac{\log\left(\frac{1}{n}\right) - \log(2\pi)}{2(\log(n)-1)^2} + \frac{\frac{\log^2\left(\frac{1}{n}\right)}{4(\log(n)-1)^2} + \frac{\log^2(2\pi)}{4(\log(n)-1)^2} - \frac{\log(2\pi)\log\left(\frac{1}{n}\right)}{2(\log(n)-1)^2} - \frac{1}{12(\log(n)-1)}}{n(\log(n)-1)} +$$

$$\frac{1}{n^2(\log(n)-1)}\left(\frac{\log^3\left(\frac{1}{n}\right)}{8(\log(n)-1)^3} - \frac{\log^3(2\pi)}{8(\log(n)-1)^3} - \frac{3\log(2\pi)\log^2\left(\frac{1}{n}\right)}{8(\log(n)-1)^3} + \right.$$

$$\left.\frac{3\log^2(2\pi)\log\left(\frac{1}{n}\right)}{8(\log(n)-1)^3} - \frac{\log\left(\frac{1}{n}\right)}{12(\log(n)-1)^2} + \frac{\log(2\pi)}{12(\log(n)-1)^2}\right) + \frac{1}{n^3(\log(n)-1)}$$

$$8\,(\log(n)-1) \qquad 12\,(\log(n)-1) \qquad 12\,(\log(n)-1)\Big) \qquad n\,(\log(n)-1)$$

$$\left(\frac{\log^4\left(\frac{1}{n}\right)}{16\,(\log(n)-1)^4}+\frac{\log^4(2\,\pi)}{16\,(\log(n)-1)^4}-\frac{\log(2\,\pi)\log^3\left(\frac{1}{n}\right)}{4\,(\log(n)-1)^4}-\frac{\log^3(2\,\pi)\log\left(\frac{1}{n}\right)}{4\,(\log(n)-1)^4}-\frac{\log^2\left(\frac{1}{n}\right)}{16\,(\log(n)-1)^3}+\right.$$

$$\left.\frac{3\log^2(2\,\pi)\log^2\left(\frac{1}{n}\right)}{8\,(\log(n)-1)^4}-\frac{\log^2(2\,\pi)}{16\,(\log(n)-1)^3}+\frac{\log(2\,\pi)\log\left(\frac{1}{n}\right)}{8\,(\log(n)-1)^3}+\frac{1}{360\,(\log(n)-1)}+\frac{1}{144\,(\log(n)-1)^2}\right)+$$

$$\frac{1}{n^4\,(\log(n)-1)}\left(\frac{\log^5\left(\frac{1}{n}\right)}{32\,(\log(n)-1)^5}-\frac{\log^5(2\,\pi)}{32\,(\log(n)-1)^5}-\frac{5\log(2\,\pi)\log^4\left(\frac{1}{n}\right)}{32\,(\log(n)-1)^5}+\frac{5\log^4(2\,\pi)\log\left(\frac{1}{n}\right)}{32\,(\log(n)-1)^5}-\right.$$

$$\frac{\log^3\left(\frac{1}{n}\right)}{24\,(\log(n)-1)^4}+\frac{\log^3(2\,\pi)}{24\,(\log(n)-1)^4}+\frac{\log(2\,\pi)\log^2\left(\frac{1}{n}\right)}{8\,(\log(n)-1)^4}-\frac{\log^2(2\,\pi)\log\left(\frac{1}{n}\right)}{8\,(\log(n)-1)^4}+\frac{5\log^2(2\,\pi)\log^3\left(\frac{1}{n}\right)}{16\,(\log(n)-1)^5}-$$

$$\left.\frac{5\log^3(2\,\pi)\log^2\left(\frac{1}{n}\right)}{16\,(\log(n)-1)^5}+\frac{\log\left(\frac{1}{n}\right)}{360\,(\log(n)-1)^2}+\frac{\log\left(\frac{1}{n}\right)}{96\,(\log(n)-1)^3}-\frac{\log(2\,\pi)}{360\,(\log(n)-1)^2}-\frac{\log(2\,\pi)}{96\,(\log(n)-1)^3}\right)+$$

$$\frac{1}{n^5\,(\log(n)-1)}\left(\frac{\log^6\left(\frac{1}{n}\right)}{64\,(\log(n)-1)^6}+\frac{\log^6(2\,\pi)}{64\,(\log(n)-1)^6}-\frac{3\log(2\,\pi)\log^5\left(\frac{1}{n}\right)}{32\,(\log(n)-1)^6}-\frac{3\log^5(2\,\pi)\log\left(\frac{1}{n}\right)}{32\,(\log(n)-1)^6}-\right.$$

$$\frac{5\log^4\left(\frac{1}{n}\right)}{192\,(\log(n)-1)^5}-\frac{5\log^4(2\,\pi)}{192\,(\log(n)-1)^5}-\frac{5\log^3(2\,\pi)\log^3\left(\frac{1}{n}\right)}{16\,(\log(n)-1)^6}+\frac{5\log(2\,\pi)\log^3\left(\frac{1}{n}\right)}{48\,(\log(n)-1)^5}+$$

$$\frac{5\log^3(2\,\pi)\log\left(\frac{1}{n}\right)}{48\,(\log(n)-1)^5}+\frac{\log^2\left(\frac{1}{n}\right)}{480\,(\log(n)-1)^3}+\frac{\log^2\left(\frac{1}{n}\right)}{96\,(\log(n)-1)^4}-\frac{5\log^2(2\,\pi)\log^2\left(\frac{1}{n}\right)}{32\,(\log(n)-1)^5}+\frac{\log^2(2\,\pi)}{480\,(\log(n)-1)^3}+$$

$$\frac{\log^2(2\,\pi)}{96\,(\log(n)-1)^4}+\frac{15\log^2(2\,\pi)\log^4\left(\frac{1}{n}\right)}{64\,(\log(n)-1)^6}+\frac{15\log^4(2\,\pi)\log^2\left(\frac{1}{n}\right)}{64\,(\log(n)-1)^6}-\frac{\log(2\,\pi)\log\left(\frac{1}{n}\right)}{240\,(\log(n)-1)^3}-$$

$$\left.\frac{\log(2\,\pi)\log\left(\frac{1}{n}\right)}{48\,(\log(n)-1)^4}-\frac{1}{1260\,(\log(n)-1)}-\frac{1}{2160\,(\log(n)-1)^2}-\frac{1}{1728\,(\log(n)-1)^3}\right)+O\left(\left(\frac{1}{n}\right)^{11/2}\right)$$

WolframAlpha

In[37]:= **lim n->inf (n^2) / (4^log base 2 of (n))**

Limit:

Show steps

$$\lim_{n\to\infty}\frac{n^2}{4^{\log_2(n)}}=1$$

WolframAlpha

In[38]:= lim n->inf (n log base 2 of (n)) / n

Limit:

Show steps

$$\lim_{n\to\infty} \frac{n \log_2(n)}{n} = \infty$$

WolframAlpha

In[39]:= lim n->inf n / ((sqrt(2))^(log base 2 of (n))

An attempt was made to fix mismatched delimiters

Limit:

Show steps

$$\lim_{n\to\infty} \frac{n}{\sqrt{2}^{\log_2(n)}} = \infty$$

WolframAlpha

In[40]:= lim n->inf ((sqrt(2))^(log base 2 of (n)) / (2^(sqrt(2 * log base 2 of (n)))

An attempt was made to fix mismatched delimiters

Limit:

Show steps

$$\lim_{n\to\infty} \frac{\sqrt{2}^{\log_2(n)}}{2^{\sqrt{2 \log_2(n)}}} = \infty$$

WolframAlpha

In[41]:= lim n->inf (log base 2 of (n))^(1/2) / (log(log(n)))

An attempt was made to fix mismatched delimiters

Assuming “log” is the natural logarithm | Use the base 10 logarithm instead

Limit:

Show steps

$$\lim_{n\to\infty} \frac{\sqrt{\log_2(n)}}{\log(\log(n))} = \infty$$

log(x) is the natural logarithm »

Series expansion at n=∞:

More terms

$$\frac{\sqrt{-\log\left(\frac{1}{n}\right)}}{\sqrt{\log(2)}\ \log\left(-\log\left(\frac{1}{n}\right)\right)} + O\left(\left(\frac{1}{n}\right)^6\right)$$

WolframAlpha