(1)

$$\lim_{n\to\infty} \frac{\sqrt{2n-3} - \sqrt{2n+3}}{\sqrt[3]{n+4} - \sqrt[3]{n-2}}$$

$$= \lim_{n\to\infty} \frac{\sqrt{2n-3} - \sqrt{2n+3}}{\sqrt[3]{n+4} - \sqrt[3]{n-2}} \cdot \frac{\sqrt{2n-3} + \sqrt{2n+3}}{\left(\sqrt[3]{n+4}\right)^2 + \sqrt[3]{n+4}\,\sqrt[3]{n-2} + \left(\sqrt[3]{n-2}\right)^2} \cdot \frac{\left(\sqrt[3]{n+4}\right)^2 + \sqrt[3]{n+4}\,\sqrt[3]{n-2} + \left(\sqrt[3]{n-2}\right)^2}{\sqrt{2n-3} + \sqrt{2n+3}}$$

$$= \lim_{n\to\infty} \frac{2n-3-(2n+3)}{n+4-(n-2)} \cdot \frac{\sqrt[3]{(n+4)^2} + \sqrt[3]{n+4}\,\sqrt[3]{n-2} + \sqrt[3]{(n-2)^2}}{\sqrt{2n-3} + \sqrt{2n+3}} =$$

$$= \lim_{n\to\infty} \frac{-6}{6} \cdot \frac{\sqrt[3]{n^2}}{\sqrt{n}} \cdot \frac{\sqrt[3]{(1+4/n)^2} + \sqrt[3]{1+4/n}\,\sqrt[3]{1-2/n} + \sqrt[3]{(1-2/n)^2}}{\sqrt{2-3/n} + \sqrt{2+3/n}}$$

$\to \sqrt[3]{(1+0)^2}$, $\sqrt[3]{1+0}$, $\sqrt[3]{1-0}$, $\sqrt[3]{(1-0)^2}$

$n^{2/3-1/2} = n^{1/6}$ $\quad$ $\sqrt{2-0}$ $\quad$ $\sqrt{2+0}$

$$= -1 \cdot \infty \cdot \frac{1+1+1}{\sqrt{2}+\sqrt{2}} = -\infty$$

(2)

scale $\quad$ bounded · zero $\quad$ scale

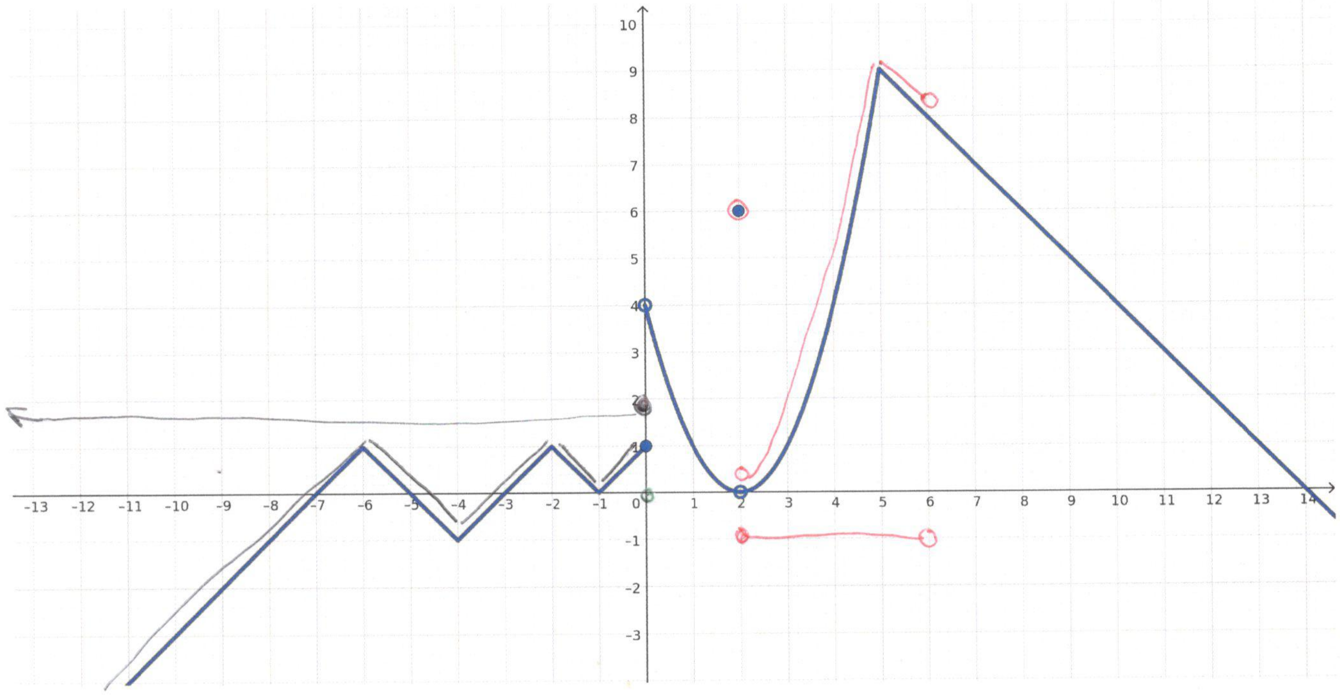
$$\lim_{n\to\infty} \frac{n! + 2^n - 3\cos(n^2) + 3n^4}{2n^4 + \ln n - 2(n!) - e^n} = \lim_{n\to\infty} \frac{n!}{n!} \cdot \frac{1 + \frac{2^n}{n!} - 3\frac{\cos(n^2)}{n!} + 3\frac{n^4}{n!}}{2\cdot\frac{n^4}{n!} + \frac{\ln n}{n!} - 2 - \frac{e^n}{n!}}$$

0 scale

$$= \frac{1+0-0+0}{0+0-2-0} = -\frac{1}{2}$$

Image $f([2,6)) = (0, 9]$ $f((-\infty,0)) = (-\infty, 1]$

$f(\{0\}) = \{1\}$



Preimage $f^{-1}((3,7]) = (0,\underbrace{b}_{=0,2}) \cup \{2\} \cup (\overset{3,8}{\overset{=}{c}},\underbrace{a}_{=4,6}] \cup [7,11)$

$f^{-1}(\{4\}) = \{4, 10\}$

$f^{-1}((-\infty,0]) = (-\infty,-7] \cup [-5,-3] \cup \{-1\} \cup [14,\infty)$