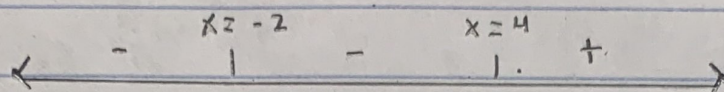


3)  $g(x)$  has the following negative and positive intervals



within  $h(x)$  this means that if:

$$g(x) \geq 4$$

$$g(x) < 4$$

$$g(x) \geq 0, \text{ so:}$$

$$g(x) < 0, \text{ so:}$$

$$f(g(x)) = \frac{-g(x)}{e}$$

$$f(g(x)) = \sqrt{|g(x)|}$$

$\therefore$  the only possibility for a discontinuity is at 4. Consider the following sequences:

$$x_n = \frac{4n^2 + n}{n^2}, \quad \lim_{n \rightarrow \infty} x_n = 4$$

$$y_n = \frac{4n^2 - n}{n^2}, \quad \lim_{n \rightarrow \infty} y_n = 4$$

$$\text{NTP: } \lim_{n \rightarrow \infty} h(x_n) \neq \lim_{n \rightarrow \infty} h(y_n)$$

$$\text{LHS: } (x_n > 4, \text{ for any } x_n)$$

$$\text{RHS: } (y_n < 4, \text{ for any } y_n)$$

$$\Rightarrow \lim_{n \rightarrow \infty} h(x_n)$$

$$\Rightarrow \lim_{n \rightarrow \infty} h(y_n)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f(g(x_n))$$

$$\Rightarrow \lim_{n \rightarrow \infty} f(g(y_n))$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(\left(\frac{4n^2 + n}{n^2} - 4\right)(\frac{4n^2 + n}{n^2} + 1)^2\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(\left(\frac{4n^2 - n}{n^2} - 4\right)(\frac{4n^2 - n}{n^2} + 1)^2\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(\left(\frac{4n^2 + n}{n^2} - 4\right)\left(\frac{4n^2 + n}{n^2} + 1\right)^2\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(\left(\frac{4n^2 - n}{n^2} - 4\right)\left(\frac{4n^2 - n}{n^2} + 1\right)^2\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(\left(4 + \frac{1}{n} - 4\right)\left(4 + \frac{1}{n} + 1\right)^2\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(\left(4 - \frac{1}{n} - 4\right)\left(4 - \frac{1}{n} + 1\right)^2\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(\frac{1}{n}\left(5 + \frac{1}{n}\right)^2\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(-\frac{1}{n}\left(5 - \frac{1}{n}\right)^2\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(\frac{1}{n}\left(25 + \frac{10}{n} + \frac{1}{n^2}\right)\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(-\frac{1}{n}\left(25 - \frac{10}{n} + \frac{1}{n^2}\right)\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(25 \cdot \frac{1}{n} + 10 \cdot \frac{1}{n} \cdot \frac{1}{n} + \frac{1}{n} \cdot \frac{1}{n} \cdot \frac{1}{n}\right)$$

$$\Rightarrow \lim_{n \rightarrow \infty} f\left(-25 \cdot \frac{1}{n} + 10 \cdot \frac{1}{n} \cdot \frac{1}{n} - \frac{1}{n} \cdot \frac{1}{n} \cdot \frac{1}{n}\right)$$

/ Note from Q1,  $\lim_{n \rightarrow \infty} \frac{1}{n} = 0$  /