

1. For what values of c is f continuous on $(-\infty, \infty)$?

$$f(x) = \begin{cases} cx^2 + 1 & \text{if } x \leq 3 \\ 2x + c & \text{if } x > 3 \end{cases}$$

2. Show that for some x we have $f(x) = 100$ if

$$f(x) = x^3 + x \sin x$$

3. Find

$$\lim_{x \rightarrow \infty} x \left(\sqrt{x^2 + a} - \sqrt{x^2 + b} \right)$$