5. (a) Define what is meant by the *limit* of a function $f(x)$ as $x \to a$. (You need not distinguish between limits from the right and from the left.) [2]

(b) Explain *informally*, in terms of the limit concept, what it means:

i. for a function to be *continuous*; [1]

ii. for a function to be *differentiable*. [1]

(c) Justifying your answers, is the function $y = |x|^3$:

i. continuous at the point where $x = 0$; [1]

ii. differentiable at the point where $x = 0$? [1]

(d) Find the value of

$$\lim_{x \to 0} \frac{1 - \cos x}{x \sin x}$$

[4]