

## Answer on Question #84076 – Math – Real Analysis

### Question

The function  $f(x) = x^2 + x$  is differentiable at  $x = -1$ .

### Solution

A function is differentiable at a point if it has a derivative there. In other words, the function  $f$  is differentiable at  $x$  if

$$\lim_{h \rightarrow 0} (f(x + h) - f(x))/h$$

exists.

Find a limit

$$\lim_{h \rightarrow 0} \frac{(x + h)^2 + (x + h) - ((x)^2 + (x))}{h} = \\ = \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 + x + h - x^2 - x}{h} = \lim_{h \rightarrow 0} \frac{2xh + h^2 + h}{h} = 2x + 1.$$

$$f'(x) = 2x + 1.$$

The function  $f(x) = x^2 + x$  is differentiable at  $x = -1$ :

$$f'(-1) = 2*(-1) + 1 = -2 + 1 = -1;$$

$$f'(-1) = -1.$$

**Answer:** Yes, the function  $f(x) = x^2 + x$  is differentiable at  $x = -1$ .