Exemplar Problems
Derivatives

1. Examine the continuity of the function f (x) = $x^3 + 2x^2 - 1$ at x = 1

Solution:

We know that, y = f(x) will be continuous at x = a if,

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$$\lim_{x \to a^-} f(x) = \lim_{x \to a} f(x) = \lim_{x \to a^+} f(x)$$

Given: $f(x) = x^3 + 2x^2 - 1$

$$\lim_{x \to 1^-} f(x) = \lim_{h \to 0} (1+h)^3 + 2(1+h)^2 - 1 = 1 + 2 - 1 = 2$$

$$\lim_{x \to 1} f(x) = (1)^3 + 2(1)^2 - 1$$
$$= 1 + 2 - 1 = 2$$

$$\lim_{x \to 1^+} f(x) = \lim_{\to} (1+h)^3 + 2(1+h)^2 - 1$$
$$= 1 + 2 - 1 = 2$$

$$\lim_{x \to 1^-} f(x) = \lim_{x \to 1} f(x) = \lim_{x \to 1^+} f(x) = 2.$$

Hence, $f(x)$ is continuous at $x = 1$.

Thus, f(x) is continuous at x = 1.