

Answer on Question #42993, Math, Calculus

State how many imaginary and real zeros the function has.

$$f(x) = x^4 - 15x^2 - 16$$

Factor the equation

$$\begin{aligned} f(x) &= x^4 - 15x^2 - 16 = x^4 - 1 - 15x^2 - 15 = (x^4 - 1) + 15(x^2 + 1) \\ &= (x^2 + 1)(x^2 - 1) + 15(x^2 + 1) = (x^2 + 1)(x^2 + 14) \end{aligned}$$

Use zero product rule:

$$(x^2 + 1)(x^2 + 14) = 0$$

If

$$x^2 + 1 = 0$$

$$(x - i)(x + i) = 0$$

$$x_{1,2} = \pm i$$

If

$$x^2 + 14 = 0$$

$$(x - \sqrt{14}i)(x + \sqrt{14}i) = 0$$

$$x_{3,4} = \pm\sqrt{14}i$$

Answer: $\{i, -i, \sqrt{14}i, -\sqrt{14}i\}$

0 – real zeros

4 – imaginary zeros