Polynomial FUNction Example 01

MATH by Wilson
Your Personal Mathematics Trainer
MathByWilson.com

$\mathbf{y = p(x) = 2x^3 + 5x^2 - x - 6}$

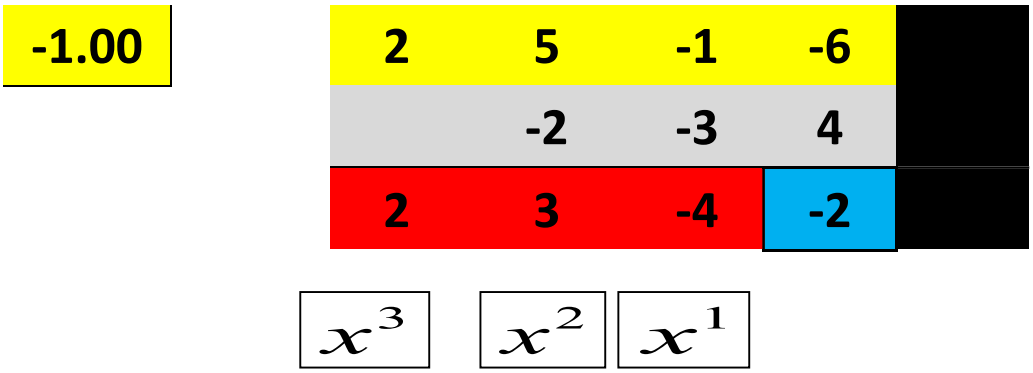
1. **Dom f** $= \mathbb{R}_x$
2. Intercept POINTS:
   a. y-intercept point: $\mathbf{p}(0) = -6 \Rightarrow (0,-6)$
   b. x-intercept point: $\mathbf{p(x)} \overset{\text{Set}}{=} 0 \Rightarrow$ Max of 3 x-intercept points
      (1) Possible rational (fractional) roots/zeroes: $\frac{\mathbf{p}}{\mathbf{q}} = \frac{\pm 6, \pm 3, \pm 2 \pm \pm 1}{\pm 2, \pm 1}$
      (2) Sign Options:
         (a) $\mathbf{y = p(x) = 2x^3 + \underbrace{5x^2 - x}_{1} - 6} \Rightarrow 1$ "+" root
         (b) $\mathbf{y = p(-x) = -\underbrace{2x^3 + 5x^2}_{1} + \underbrace{x - 6}_{2}} \Rightarrow 2$ or 0 "-" roots
      (3) Bounds:
         (a) Upper Bound: 1,2,3,4,… - LEAST

x^3	x^2	x^1	
1.00	**2**	**5**	**-1**	**-6**
		2	**7**	**6**
	2	**7**	**6**	**0**
		q(x)		r(x)

$\mathbf{x} = 1$ is both an x-intercept point and an upper bound

(b)Lower Bound: -1,-2-,3,-4,… - GREATEST

x^3	x^2	x^1

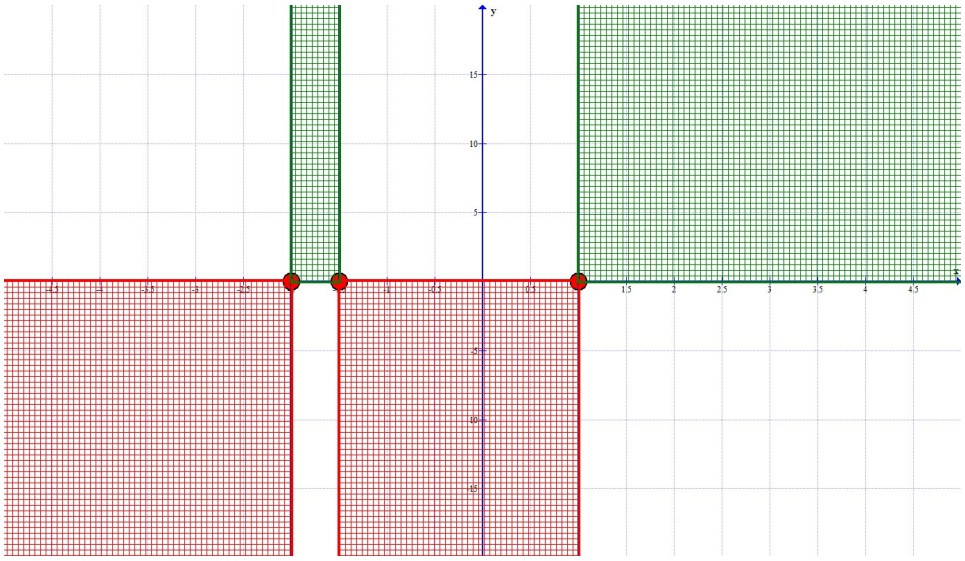


$\mathbf{x} = -3$ is a lower bound ; $\mathbf{x} = -2$ is a root

$$\mathbf{p}(\mathbf{x}) = 2\mathbf{x}^3 + 5\mathbf{x}^2 - \mathbf{x} - 6$$
$$= (\mathbf{x}+2)(2\mathbf{x}^2 + \mathbf{x} - 3)$$
$$= (\mathbf{x}+2)(2\mathbf{x}+3)(\mathbf{x}-1)$$

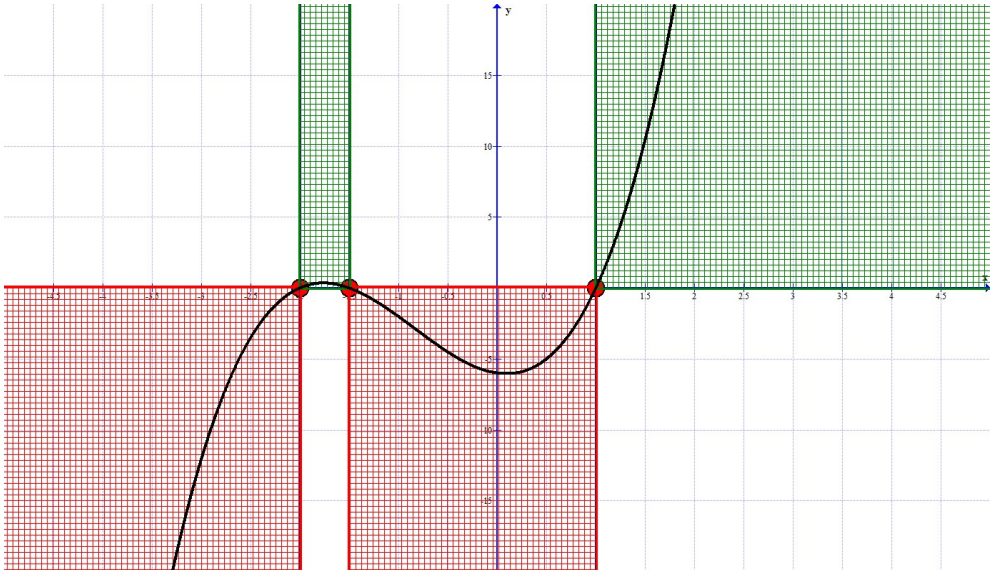
x-intercept points are $(-2,0);\left(-\frac{3}{2},0\right);(1,0)$

3. Continuity: NO Breaks!



$$\textbf{Pos}\,\mathbf{p} = \left(-2, -\frac{3}{2}\right) \cup (1, +\infty) \;;\; \textbf{Neg}\,\mathbf{p} = (-\infty, -2) \cup \left(-\frac{3}{2}, 1\right)$$

4. Behavior to/toward $\pm\infty$
   a. $\mathbf{x} \to +\infty \Rightarrow 2\mathbf{x}^3 \to +\infty \Rightarrow \mathbf{p}(\mathbf{x}) \to +\infty$
   b. $-\infty \leftarrow \mathbf{x} \Rightarrow 2\mathbf{x}^3 \to -\infty \Rightarrow \mathbf{p}(\mathbf{x}) \to -\infty$
5. Symmetry: Neither Even nor Odd
6. Graph:



7. $\textbf{Range}\,\mathbf{p} = (-\infty, +\infty)$

