# Precalculus
# Cubic inequality

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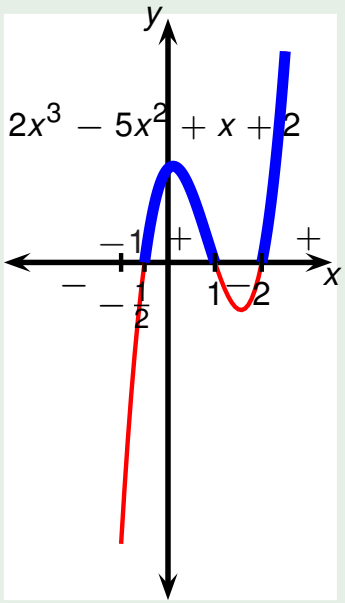
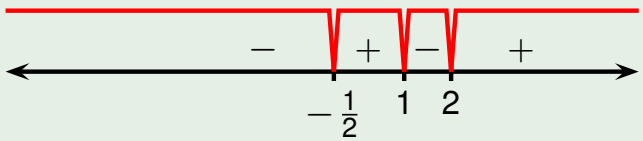
# Example




Plot the function $2x^3 - 5x^2 + x + 2$. Solve the inequality.

$$\begin{aligned} 2x^3 - 5x^2 + x + 2 &> 0 \\ 2\left(x - \left(-\tfrac{1}{2}\right)\right)(x-1)(x-2) &> 0 \\ x \in \left(-\tfrac{1}{2}, 1\right) \cup (2, \infty) & \end{aligned}$$

Left hand side vanishes when $x = -\frac{1}{2}$, when $x = 1$ and when $x = 2$. The two roots split the real line into four intervals: $\left(-\infty, -\frac{1}{2}\right), \left(-\frac{1}{2}, 1\right), (1, 2), (2, \infty)$.




| Interval | Factor signs | Final sign from plot |
|---|---|---|
| $\left(-\infty, -\frac{1}{2}\right)$ | $(-)(-)(-)$ | $-$ |
| $\left(-\frac{1}{2}, 1\right)$ | $(+)(-)(-)$ | $+$ |
| $(1, 2)$ | $(+)(+)(-)$ | $-$ |
| $(2, \infty)$ | $(+)(+)(+)$ | $+$ |