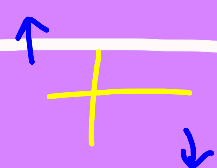
September 25, 2025

Polynomial, Rational & Radical Functions Review

$f(x) = 4x - 3x^3 + 2x^4 - x^5 + 1$



x-int/Roots = 5

Rel max/min = 4

5 = Degree − 1

$\lim\limits_{x\to-\infty} f(x) = +\infty$

far to left

y-coord

$\lim\limits_{x\to\infty} f(x) = -\infty$

far to right

$-x^8$

7 = Degree − 1

8 = Degree

3d) $2x^4+5x^3+4x^2-x-10=0$

$\frac{\pm1\ \pm2\ \pm5\ \pm10}{\pm2}$

$\underline{\quad\quad\quad}\ |\ x=1 \quad 0$

$$\begin{array}{r|rrrrr} 1 & 2 & 5 & 4 & -1 & -10 \\ + & & 2 & 7 & 11 & 10 \\ \hline & 2 & 7 & 11 & 10 & 0 \end{array}$$

$x=1$

$(x-1)(2x^3+7x^2+11x+10)$

$\underline{\quad\quad\quad}\ |\ x=-2 \quad 0$

$$\begin{array}{r|rrrr} -2 & 2 & 7 & 11 & 10 \\ + & & -4 & -6 & -10 \\ \hline & 2 & 3 & 5 & 0 \end{array}$$

$(x-1)(x+2)(2x^2+3x+5)$

$x=1 \quad x=-2$ ↑ Do quadratic formula

September 25, 2025

Find original eq.

Roots: $2, \pm 5i$ (Factoring backwards)

$x = 2$ $\quad x = 5i$ $\quad x = -5i$

$x - 2 = 0$ $\quad x - 5i =$ $\quad x + 5i = 0$

$(x-2)(x-5i)(x+5i) = 0$

$(x-2)(x^2 - 25\cancel{i^2})$

$(x-2)(x^2+25)$

$x^3 - 2x^2 + 25x - 50 = 0$

Like 6(a)

$$(x-2)(x+3)\left[\frac{4}{x-2}+\frac{3}{x+3}=\frac{2x+3}{x^2+x-6}\right]$$

$$(x+3)(x-2)$$

Check excluded values

$x \neq 2, -3$

Like (b)

$$\frac{4}{x+3} \le \frac{2}{x-5}$$

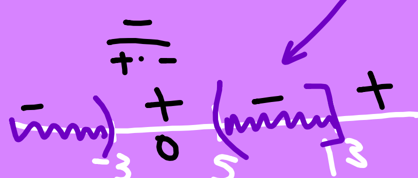
1) Set < 0 or > 0
2) Make common denom
3) Test points

PRACTICE THIS!

$$\frac{(x-5)\,4}{(x-5)(x+3)} - \frac{2\,(x+3)}{(x-5)(x+3)} \le 0$$

$$\frac{4x-20-2x-6}{(x+3)(x-5)}$$

$$\frac{2x-26}{(x+3)(x-5)} \le 0$$



$$(-\infty, -3) \cup (5, 13]$$

September 25, 2025

8/ Pull out common factors!

$$\frac{6x^2(x+4)^{-2}(2x+7)^{1/2} - 30x(x+4)^{-1}(2x+7)^{-1/2}}{\left[(2x+7)^{1/2}\right]^2}$$

$+ + \frac{1}{2}$ -2

$$\frac{6x\,\cancel{(x+4)^{-2}}\,\cancel{(2x+7)^{-1/2}}\left[x(2x+7)^1 - 5(x+4)\right]}{(2x+7)^{1+1/2}}$$

$$\frac{2x^2+7x-5x-20}{(x+4)^2(2x+7)^{3/2}}$$

$$\frac{2x^2+2x-20}{(x+4)^2(2x+7)^{3/2}}$$