

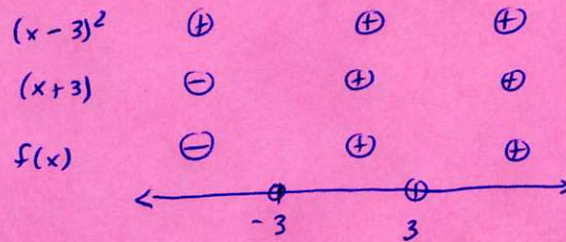
5. Find all values of x such that $f(x) > 0$ and all x so that $f(x) < 0$, and sketch the graph of f .

Hint: factor.

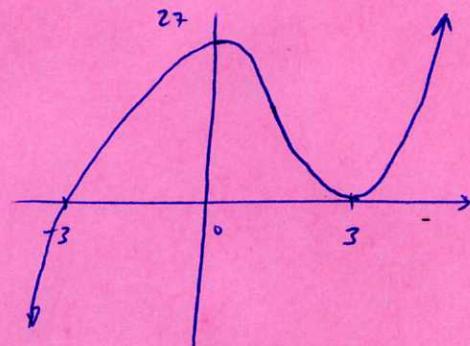
$$\begin{aligned} f(x) &= x^3 - 3x^2 - 9x + 27 \\ &= x^2(x-3) - 9(x-3) \\ &= (x^2-9)(x-3) \\ &= (x-3)(x+3)(x-3) \\ &= (x-3)^2(x+3) \end{aligned}$$

Zeros at $x = \pm 3$

$$\begin{aligned} y\text{-int: } f(0) &= 0 - 0 - 0 + 27 \\ &= 27 \end{aligned}$$



(10 pts)



6. Show that the equation has no rational root. Justify your answer.

(10 pts)

$$x^5 - 4x^2 + 7x - 3 = 0$$

$$p \text{ div } -3: p = \pm 1, \pm 3$$

$$q \text{ div } 1: q = \pm 1$$

$$\text{possible roots } \frac{p}{q}: \pm 3, \pm 1$$

$$\begin{array}{r|rrrrrr} 1 & 1 & 0 & 0 & -4 & 7 & -3 \\ & & 1 & 1 & 1 & -3 & 4 \\ \hline & 1 & 1 & 1 & -3 & 4 & 1 \end{array}$$

$$\begin{array}{r|rrrrrr} -1 & 1 & 0 & 0 & -4 & 7 & -3 \\ & & -1 & 1 & -1 & 5 & -12 \\ \hline & 1 & -1 & 1 & -5 & 12 & -15 \end{array}$$

$$\begin{array}{r|rrrrrr} 3 & 1 & 0 & 0 & -4 & 7 & -3 \\ & & 3 & 9 & 27 & 69 & 228 \\ \hline & 1 & 3 & 9 & 23 & 76 & 225 \end{array}$$

$$\begin{array}{r|rrrrrr} -3 & 1 & 0 & 0 & -4 & 7 & -3 \\ & & -3 & 9 & -27 & 93 & -300 \\ \hline & 1 & -3 & 9 & -31 & 100 & -303 \end{array}$$

None of the remainders are 0, so none of the possible roots are really roots.