

arm up

$$1 \quad +4 \quad -2 \quad -10 \quad +5 = \cancel{0}$$

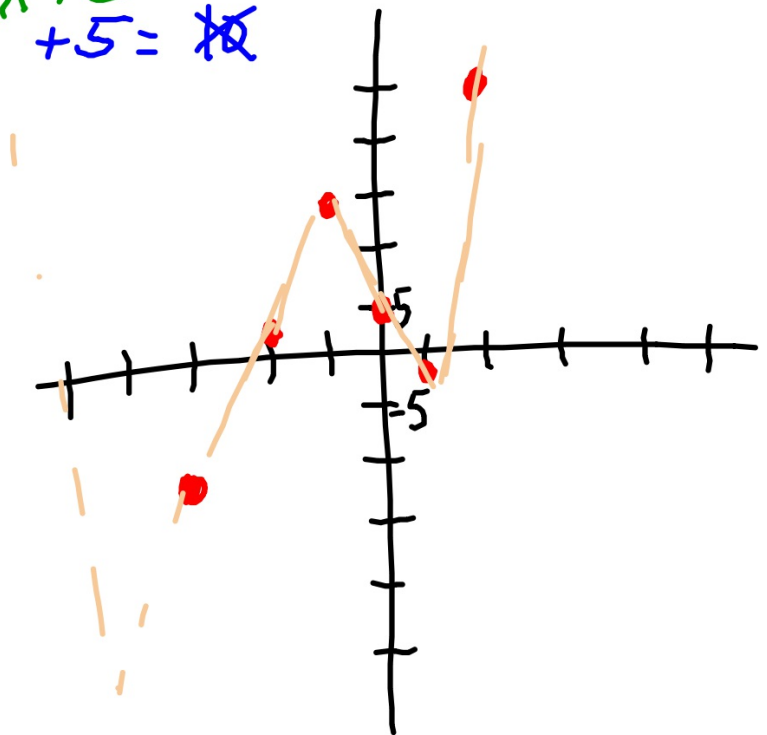
$$x^4 + 4x^3 - 2x^2 - 10x + 5$$

$$1 \quad -4 \quad -2 \quad +10 \quad +5 = \cancel{0}$$

$$\frac{p}{q}: \pm 1, \pm 5$$

Pos: 2 or 0

Neg: 2 or 0



og 180 # 29-32
 $-2^4 + 13^3 - 21^2 + 2 + 8 = 0$

$y = -2x^4 + 13x^3 - 21x^2 + 2x + 8$
 $\frac{p}{q}: \pm 1, \pm 2, \pm 4, \pm 8, \pm \frac{1}{2}$

Pos: 3 or 1

Neg: 1

$$\begin{array}{r|rrrrr} -2 & 13 & -21 & 2 & 8 & \\ & -2 & 11 & -10 & -8 & \\ \hline & -2 & 11 & -10 & -8 & 0 \end{array}$$

$$\begin{array}{r|rrrr} -2 & 11 & -10 & -8 & \\ & -4 & 14 & 8 & \\ \hline & -2 & 7 & 4 & 0 \end{array}$$

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

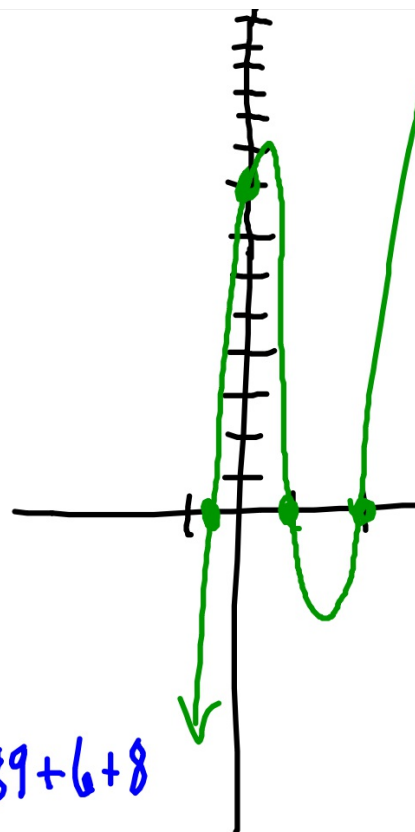
$2x^2 - 7x - 4 = 0$

$(2x+1)(x-4) = 0$

$x = -\frac{1}{2}, 4, 2, 1$

y-int: (0, 8)

$f(3) = -162 + 351 - 189 + 6 + 8$



$$f(x) = 4x^4 - 17x^2 + 4$$

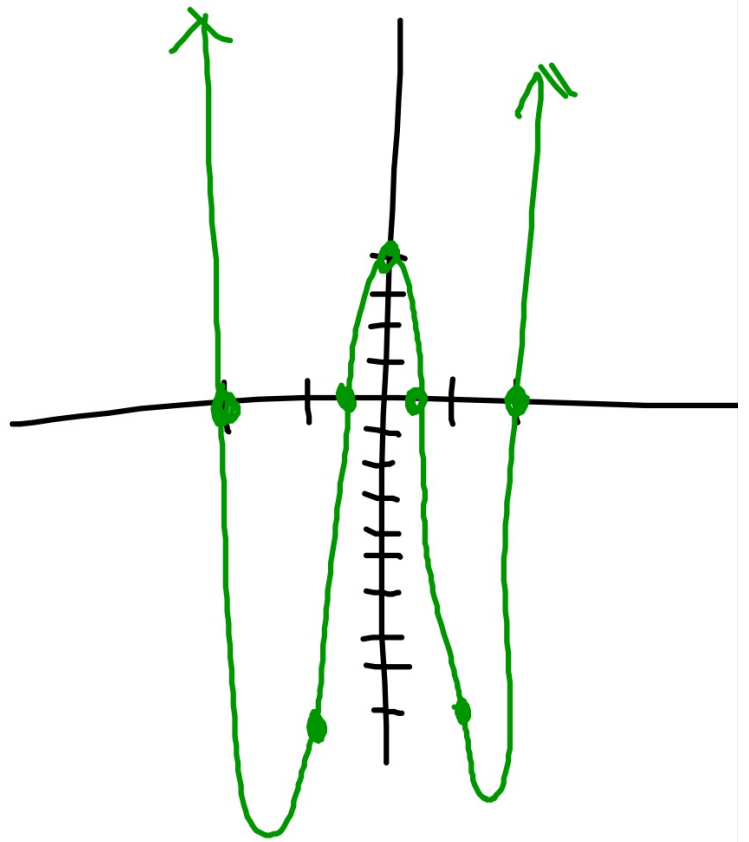
$$(4x^2 - 1)(x^2 - 4)$$

$$x = \pm \frac{1}{2}, \pm 2$$

$$y\text{-int} : (0, 4)$$

$$f(1) = 4 - 17 + 4 = -9$$

$$f(-1) = 4 - 17 + 4 = -9$$



31) $f(x) = 32x^3 - 52x^2 + 17x + 3 = 0$
 $\frac{p}{q}: \pm 1, \pm 3, \pm \frac{1}{2}, \pm \frac{1}{4}, \pm \frac{1}{8}, \pm \frac{1}{16}, \pm \frac{1}{32}, \pm \frac{3}{2}, \pm \frac{3}{4}, \pm \frac{3}{8}, \pm \frac{3}{16}, \pm \frac{3}{32}$

Pos: 2 or 0

Neg: 1

$$\begin{array}{r|rrrr} 1 & 32 & -52 & 17 & 3 \\ & & 32 & -20 & -3 \\ \hline & 32 & -20 & -3 & 0 \end{array}$$

$$32x^2 - 20x - 3 = 0$$

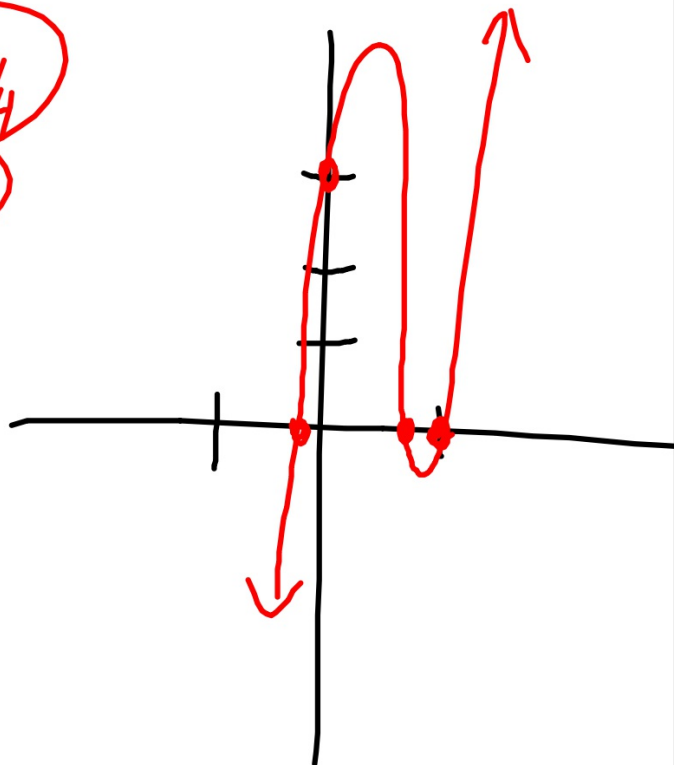
$$x^2 - 20x - 96$$

$$(x - \frac{24}{32})(x + \frac{4}{32})$$

$$(x - \frac{3}{4})(x + \frac{1}{8})$$

$$x = 1, \frac{1}{8}, \frac{3}{4}$$

$$y\text{-int: } (0, 3)$$



$$2) f(x) = 4x^3 + 7x^2 - 11x - 18 = x$$

$$\frac{p}{q}: \pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{9}{2}, \pm \frac{1}{4}, \pm \frac{3}{4}, \pm \frac{9}{4}$$

Pos: 1

Neg: 2 or 0

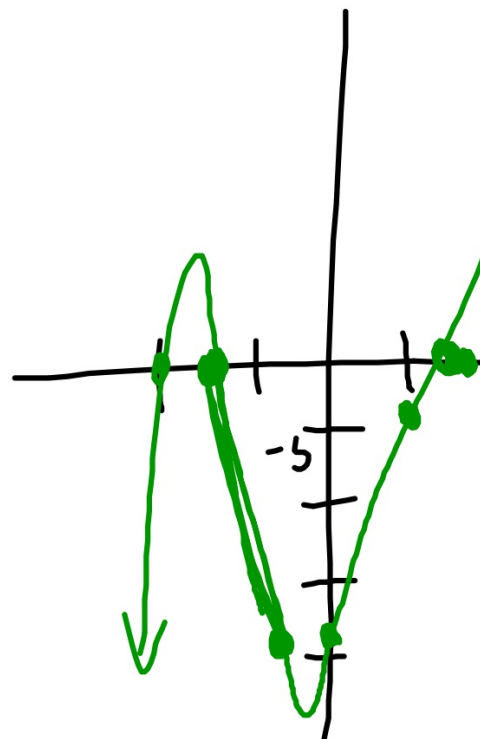
$$\begin{array}{r|rrrr} 2 & 4 & 7 & -11 & -18 \\ & & -8 & 2 & 18 \\ \hline & 4 & -1 & -9 & 0 \end{array}$$

$$4x^2 - x - 9$$

$$x = \frac{1 \pm \sqrt{1+144}}{8}$$

$$x = \frac{1 \pm \sqrt{145}}{8}, -2$$

$$x\text{-int: } (0, -18)$$



④⑦ $2x^3 + 3x^2 + 50x + 75$

$$\begin{array}{r}
 \overline{2x+3} \\
 x^2+25 \overline{) 2x^3+3x^2+50x+75} \\
 \underline{-(2x^3 + 50x)} \\
 3x^2 + 75 \\
 \underline{-(3x^2 + 75)} \\
 0
 \end{array}$$

$$(x-5i)(x+5i)(x^2+25)$$

180 # 56-72 even