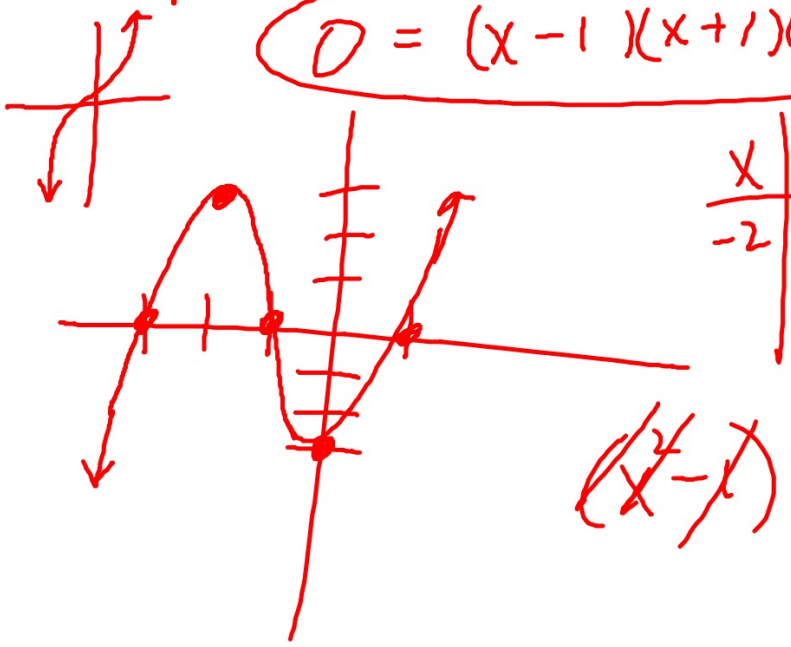
9.) $f(x) = x^2(x+3) - 1(x+3)$

$0 = (x-1)(x+1)(x+3)$



x	y
-2	3

$f(x) = x^3 + 3x^2 - x - 3$

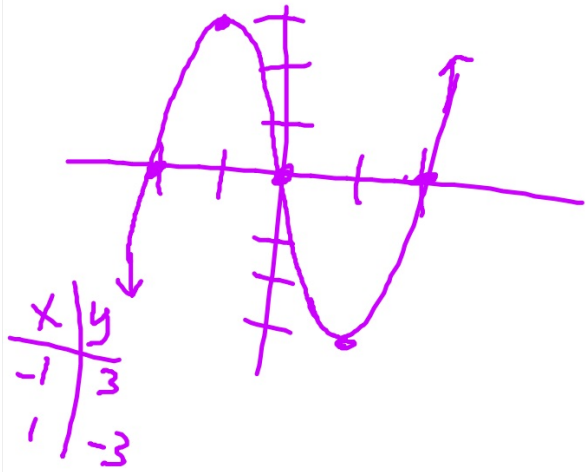
-2	1	3	-1	-3
		-2	-2	6
	1	1	-3	(3)

$(x^2 - x)$

6) $f(x) = x^3 - 4x$

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

$x = 0, 2, -2$



x	y
-1	3
1	-3

$y = (x-1)^2(x+1)^3$

8) $h(x) = x^4 - 2x^3 - 3x^2 + 2x + 2$

1	1	-2	-3	2	2
		1	-1	-4	-2
	1	-1	-4	-2	0

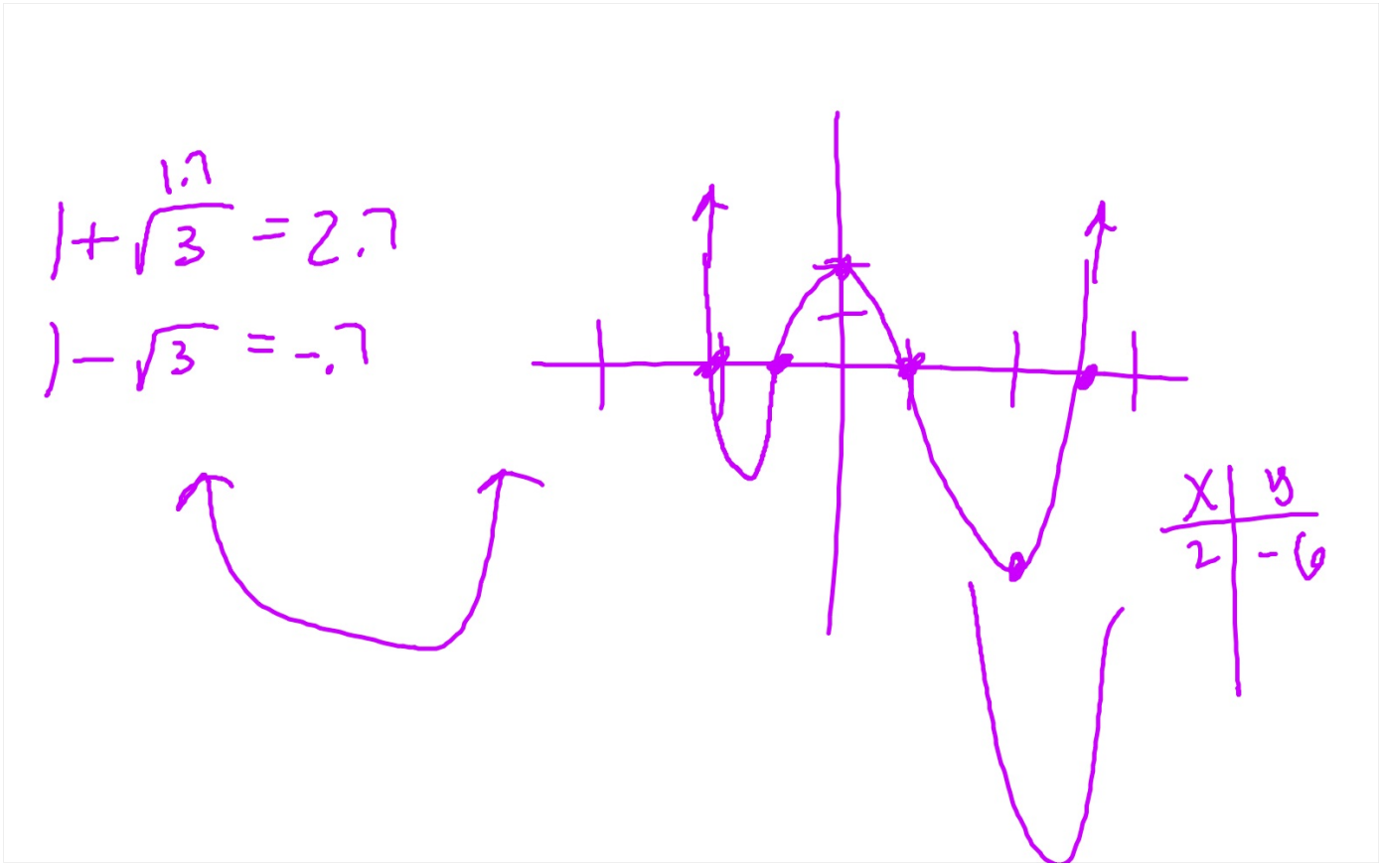
$\{-1, 1$

-1	1	-1	-4	-2
		-1	2	2
	1	-2	-2	0

$x^2 - 2x - 2 = 0$

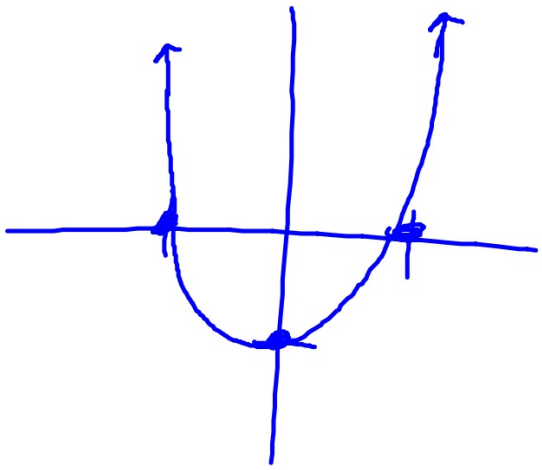
$x = \frac{2 \pm \sqrt{4+8}}{2} = \frac{2 \pm 2\sqrt{3}}{2}$

$= 1 \pm \sqrt{3}$


1.7
1+√3 = 2.7
1−√3 = −.7
+
−
+
x | y
2 | −6

11.) $f(x) = x^4 - 1$

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



7.) $y = \frac{-1}{5}x(x-4)^2$

a.) 0, 4
cross bounce

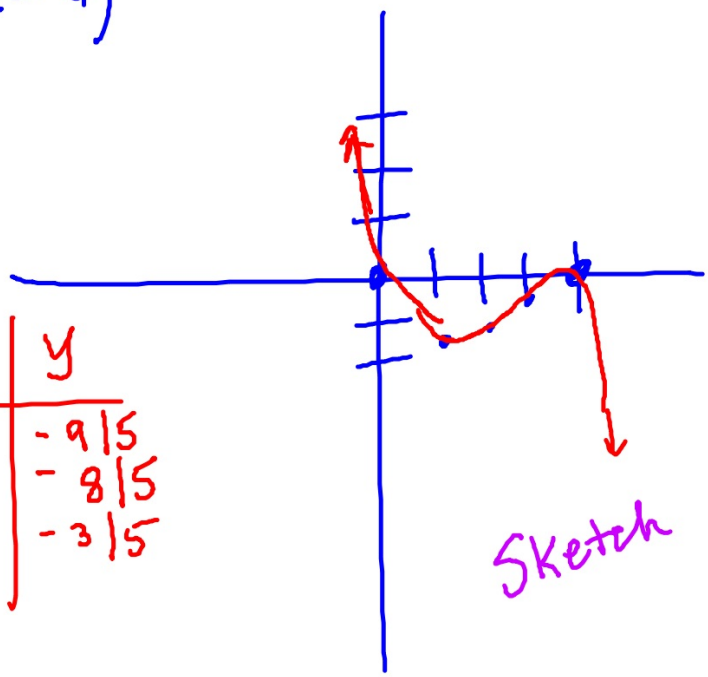
b.) $y = 0$

d.) ↑ ↓

$x \to -\infty \quad y \to \infty$

$x \to \infty \quad y \to -\infty$

x	y
1	-9/5
2	-8/5
3	-3/5



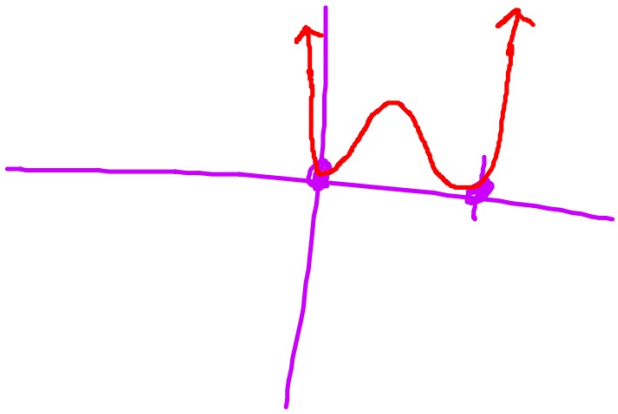
Sketch

12.) $f(x) = x^2(x^2 - 2x + 1)$

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

$x = 0$ bounce

$x = 1$ bounce



25) $f(x) = 18x^4 - 54x^2 + 40$

$0 = 2(9x^4 - 27x^2 + 20)$

$0 = 2(3x^2 - 5)(3x^2 - 4)$

$x = \pm\sqrt{\frac{5}{3}} = \frac{\pm\sqrt{15}}{3}$ $\quad x = \frac{\pm 2\sqrt{3}}{3}$

26.) $f(x) = 64x^7 + x^4$

$0 = x^4(64x^3 + 1)$

$0 = x^4(4x+1)(16x^2 - 4x + 1)$

0, mult. of 4

$-1/4$

$\frac{4 \pm \sqrt{-48}}{32}$

$\frac{4 \pm 4i\sqrt{3}}{32}$

$\frac{1}{8} \pm \frac{i\sqrt{3}}{8}$

27.) $f(x) = 6x^3 + 5x^2 - 9x + 2$

$2/3$ | 6 5 −9 2

4 6 −2

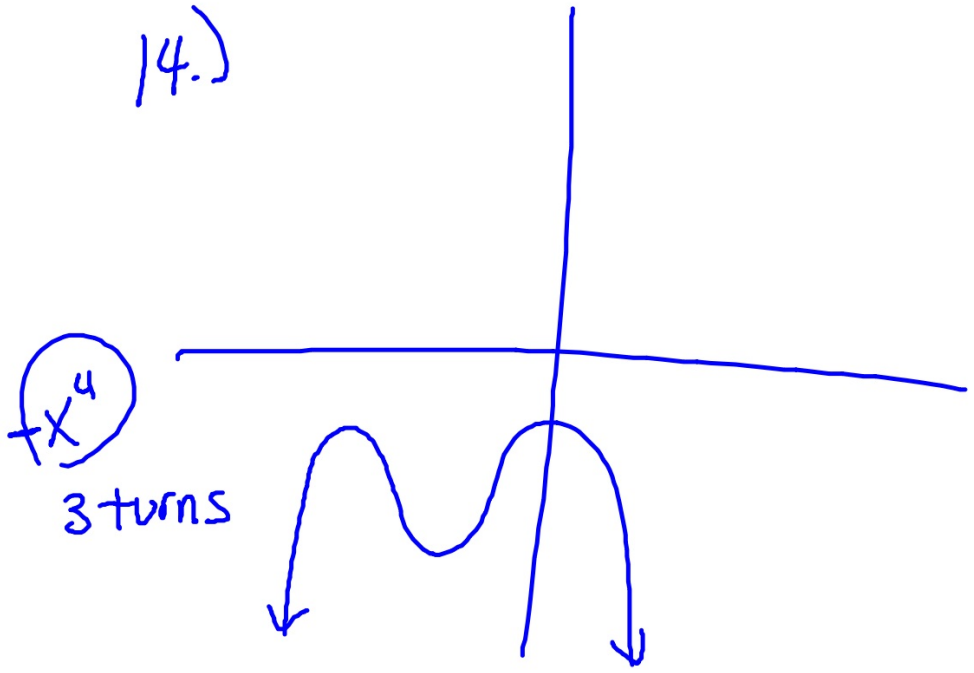
6 9 −3 0

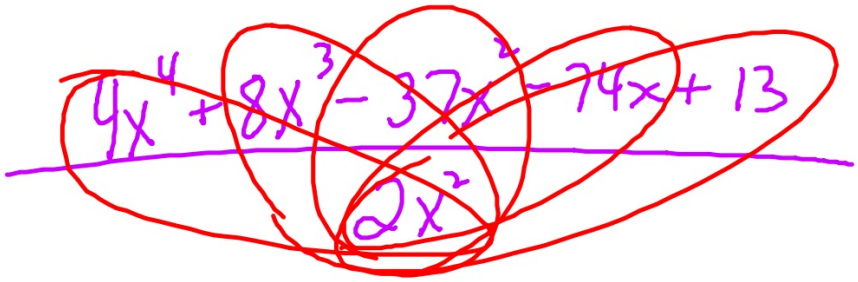
$6x^2 + 9x - 3 = 0$

$3(2x^2 + 3x - 1) = 0$

$x = \frac{-3 \pm \sqrt{17}}{4}$

14.)





$$2x^2 + 4x - \frac{37}{2} - \frac{37}{x} + \frac{13}{2x^2}$$

x^{-1}

$x^2 - \sqrt{3}x + 7\sqrt{}$

$x^2 - 3ix + 7$ X

Laws of exponents
Add, subtract, multiply and divide polynomials
Synthetic/direct substitution
Solving polynomial equations
factor sum and difference of cubes
Sketch polynomial functions

2.) $\dfrac{3x^{0}y^{2}x^{1}}{(2x^{-4})(4x^{2}y)} \div \dfrac{(2x^{-4})^{3}}{2y^{-4}}$

$\dfrac{3xy^{2}}{8x^{-2}y} \cdot \dfrac{2y^{4}}{(2x^{-4})^{3}y^{-4}}$

$\dfrac{3y}{8x} \cdot \dfrac{12x^{12}}{48y^{4}}$

$\dfrac{3yx^{12}}{32xy^{4}}$

$\dfrac{3x^{11}}{32y^{3}}$

5. $h - f$

$(x-3) - (9-x^2)$

$x^2 + x - 12$

4.) $4x^4 - 7x^3 + 6x^2 - 5$

$8g(2)$

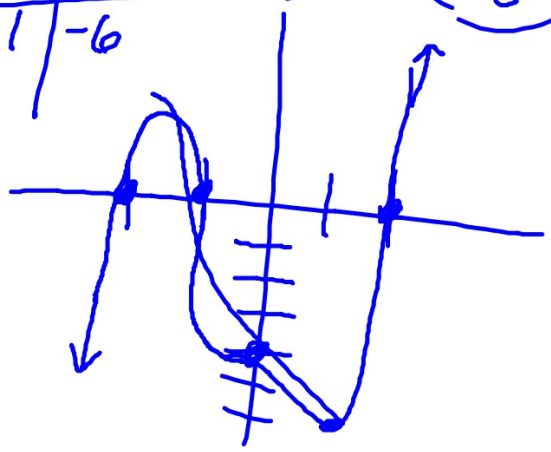
2	4	-7	6	0	-5

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

$0 = (x^3+1)(x+2)(x-2)$

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

x	y
1	-6



29) $f(2-i)=0$ $f(x)=x^5-6x^4+11x^3-x^2-14x+5$

$2-i,\ 2+i$ x^2-4x+5

sum: 4 -4

product: 5

(x^2-4x+5)

$2+i, 2-i, -1,$

x^3-2x^2-2x+1

$$\begin{array}{r|l} x^2-4x+5 & x^5-6x^4+11x^3-x^2-14x+5 \\ & -(x^5-4x^4+5x^3) \\ \hline & -2x^4+6x^3-x^2 \\ & -(-2x^4+8x^3-10x^2) \\ \hline & -2x^3+9x^2-14x \\ & -(-2x^3+8x^2-10x) \\ \hline & x^2-4x+5 \\ & -(x^2-4x+5) \\ \hline & 0 \end{array}$$

$2\uparrow$

$$\begin{array}{r|cccc} -1 & 1 & -2 & -2 & 1 \\ & & -1 & 3 & -1 \\ \hline & 1 & -3 & 1 & 0 \end{array}$$

$x^2-3x+1=0$ $\uparrow$

27.) $f(x) = 6x^3 + 5x^2 - 9x + 2$

$\frac{P}{q}: \pm 1, \pm 2, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}, \pm \frac{2}{3}$

$$\begin{array}{r|cccc} 2/3 & 6 & 5 & -9 & 2 \\ & & 4 & 6 & -2 \\ \hline & 6 & 9 & -3 & 0 \end{array}$$

$6x^2 + 9x - 3 = 0$

$3(2x^2 + 3x - 1) = 0$

$x = \frac{-3 \pm \sqrt{17}}{4}$

find all zeros

25.) $f(x) = 18x^4 - 54x^2 + 40$

26.) $f(x) = 64x^7 + x^4$

25) $0 = 2(9x^4 - 27x^2 + 20)$

$0 = 2(3x^2 - 4)(3x^2 - 5)$ *

3 3
4 5

$3x^2 = 4$ $\quad 3x^2 = 5$

$\sqrt{x^2} = \sqrt{\frac{4}{3}}$ $\quad x^2 = \frac{5}{3}$

$x = \pm\frac{2\sqrt{3}}{3}$ $\quad x = \pm\frac{\sqrt{15}}{3}$

26.) $= x^4(64x^3 + 1)$

$0 = x^4(4x+1)(16x^2 - 4x + 1)$

$x = 0$ $\quad x = -\frac{1}{4}$ $\quad x = \frac{1 \pm i\sqrt{3}}{8}$

m. of 4

$$\frac{4x^4+8x^3-37x^2-74x+13}{2x^2}$$

$$\frac{4x^4}{2x^2}+\frac{8x^3}{2x^2}-\frac{37x^2}{2x^2}-\frac{74x}{2x^2}+\frac{13}{2x^2}$$

$$2x^2+4x-\frac{37}{2}-\frac{37}{x}+\frac{13}{2x^2}$$