College Alg 3-1-3-4 Review pg. 390 1-27 ALL

1) $f(x) = (x-3)^2 - 4$ opens up

① Vertex $(3, -4)$

② x-intercept Set $y=0$ Solve for x

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

$+4 \quad +4$

$\sqrt{+4} = \sqrt{(x-3)^2}$

$\pm 2 = x - 3$

$x = 3+2$ $x = 3-2$

$x = 5$ $x = 1$

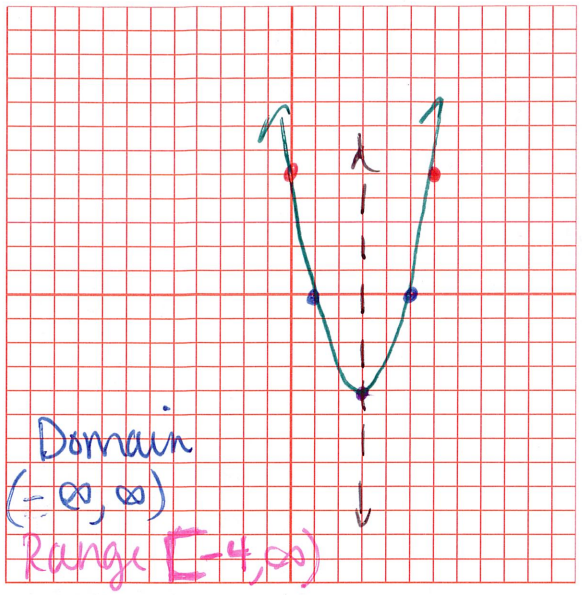
$(5, 0)$ $(1, 0)$

③ y-intercept Set $x=0$ solve for y

$y = (0-3)^2 - 4$

$y = 9 - 4$

$y = 5$ $(0, 5)$



Axis of Symm $x = 3$

2) $f(x) = 5 - (x+2)^2$

Rewrite it as $f(x) = -(x+2)^2 + 5$

Vertex $(-2, 5)$ opens down

x-intercepts $0 = -1(x+2)^2 + 5$

$\frac{-5}{-1} = \frac{-1(x+2)^2}{-1}$

$\sqrt{5} = \sqrt{(x+2)^2}$ $x = -2 \pm \sqrt{5}$

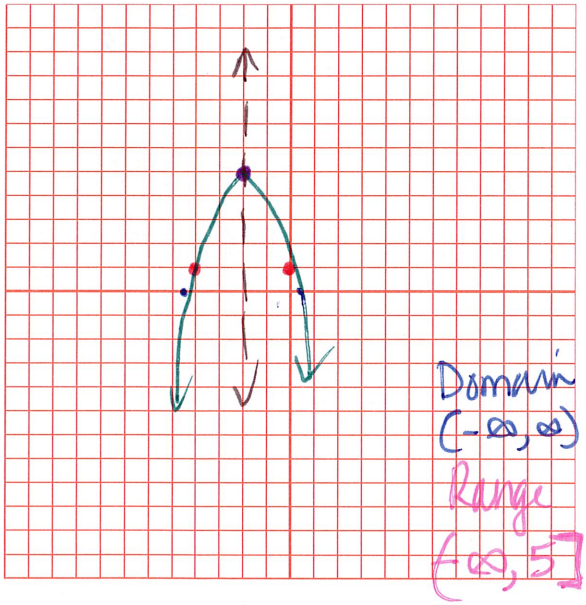
$(.24, 0)$ $(-4.24, 0)$

y-intercept

$y = -(0+2)^2 + 5$

$y = -4 + 5$ $(0, 1)$

$y = 1$



$x = -2$ Axis of Symm

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

Standard form so find $\left(\frac{-b}{2a}, P; C\right)$

Vertex $(-2, 9)$

$-(-2)^2 - 4(-2) + 5$ $\frac{4}{2(-1)}$

$y = -4 + 8 + 5$

$y = 4 + 5$

x-intercepts $0 = -1(x^2 + 4x - 5)$ factor $-5, 1; 4$

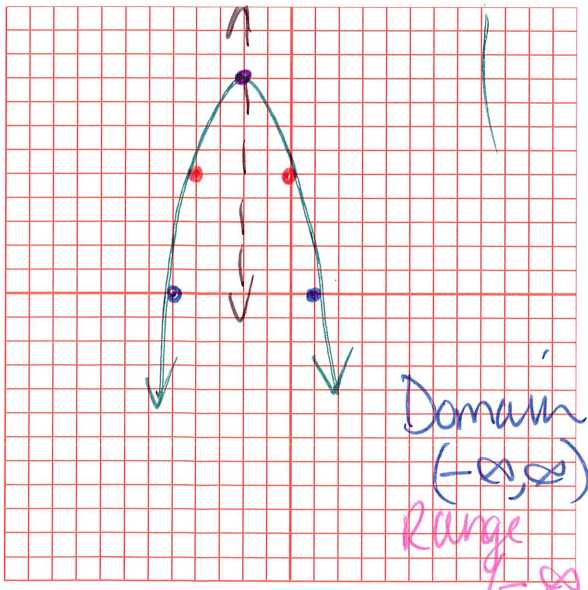
$0 = -1(x+5)(x-1)$

$x = -5$ $x = 1$

$(-5, 0)$

$(1, 0)$

y-intercept $(0, 5)$



Axis of Symm $x = -2$

#4 $f(x) = 3x^2 - 6x + 1$ opens up

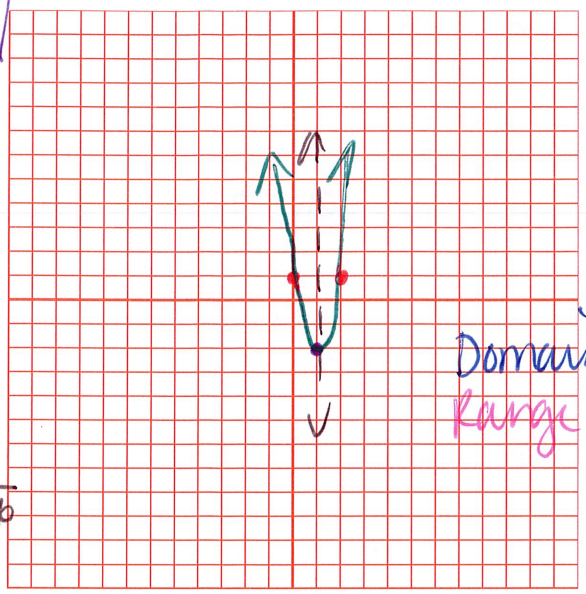
Vertex $\left(\frac{-b}{2a}, P;C\right)$ $\frac{6}{2(3)}$

$(1, -2)$ Vertex

$3(1)^2 - 6(1) + 1$

$3 - 6 + 1$

$-3 + 1$



axis of Sym

$x = 1$

Domain $(-\infty, \infty)$

Range $[-2, \infty)$

X-intercepts

$0 = 3x^2 - 6x + 1$ quad form

$x = \frac{+6 \pm \sqrt{(6)^2 - 4(3)(1)}}{2(3)}$

$x = \frac{6 \pm \sqrt{36 - 12}}{6}$

$x = \frac{6 \pm \sqrt{24}}{6}$ $x = \frac{6 \pm \sqrt{4}\sqrt{6}}{6}$

$x = 1 \pm \frac{\sqrt{6}}{3}$ $x = \frac{6 \pm 2\sqrt{6}}{6}$

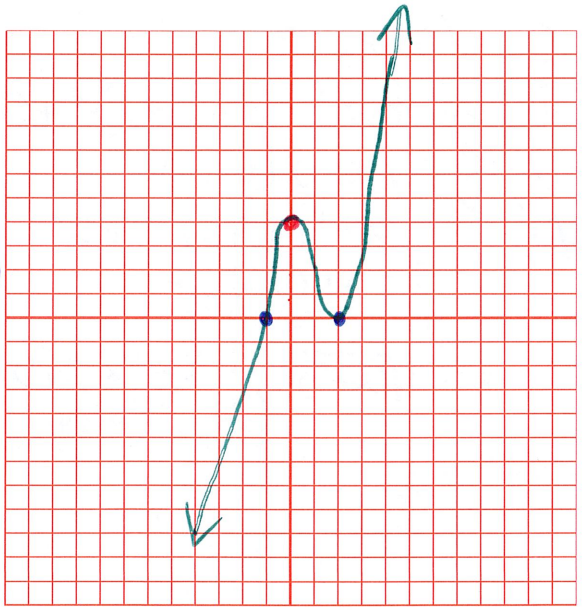
$x = \frac{3 \pm \sqrt{6}}{3}$ $x = 1.82$ $x = .18$

y-intercept

$(0, 1)$

#5

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



$x = 2$ Mult 2 Love tap

$x = -1$ Mult 3 right through

degree of 5 JohnTravolta

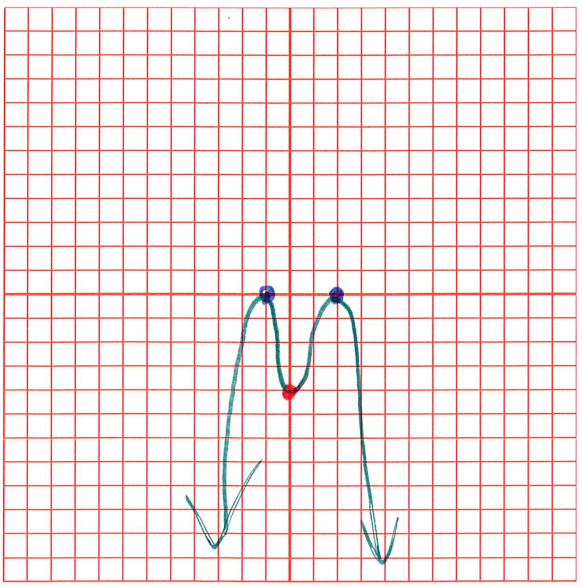
y-intercept set $x = 0$ solve for y

$y = (0-2)^2 (0+1)^3$ $(0, 4)$

$y = (4)(1)$

#6

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



Degree 4 negative leading Coef

open down field goal

$x = 2$ Mult 2 love tap

$x = -1$ Mult 2 love tap

y-intercept $y = -(0-2)^2 (0+1)^2$

$y = -1(4)(1)$

$y = -4$ $(0, -4)$

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

$\frac{P}{q}$ Possible rational roots

$\pm 1, \pm 2, \pm 4$

$\frac{\pm 1, \pm 2, \pm 4}{\pm 1}$

graph on Calc

roots look like $x = -2$ $x = 1$ $x = 2$

Check on Calc

John Travolta With Right hand goes right through

- $(-2, 0)$
- $(1, 0)$
- $(2, 0)$

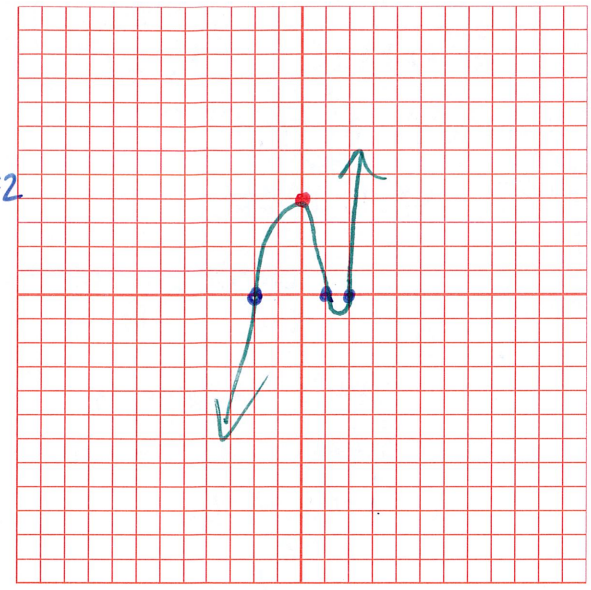
y-intercept $(0, 4)$

Could have boxed & circle factored

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

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

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



#8 $f(x) = x^4 - 5x^2 + 4$ degree of 4 Field goal ↑ ↑

Call $x^2 = m$ Chunking

$(x^2)^2 - 5(x^2) + 4$

$m^2 - 5m + 4 = 0$

$(m-1)(m-4) = 0$

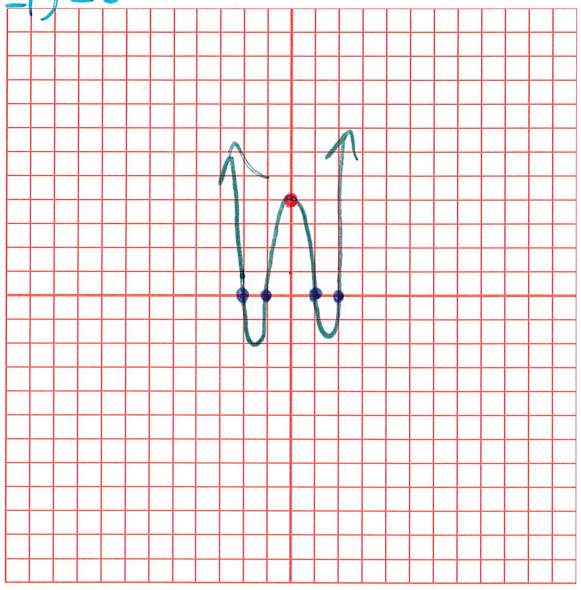
$m = 1$ $m = 4$

$\sqrt{x^2} = \sqrt{1}$ $\sqrt{x^2} = \sqrt{4}$

$x = \pm 1$ $x = \pm 2$

4: $\pm 1, \pm 4$; -5

$(1, 0)$ $(-1, 0)$ $(2, 0)$ $(-2, 0)$



y-intercept $(0, 4)$

#9 $f(x) = -(x+1)^6$

degree of 6 field goal opening down

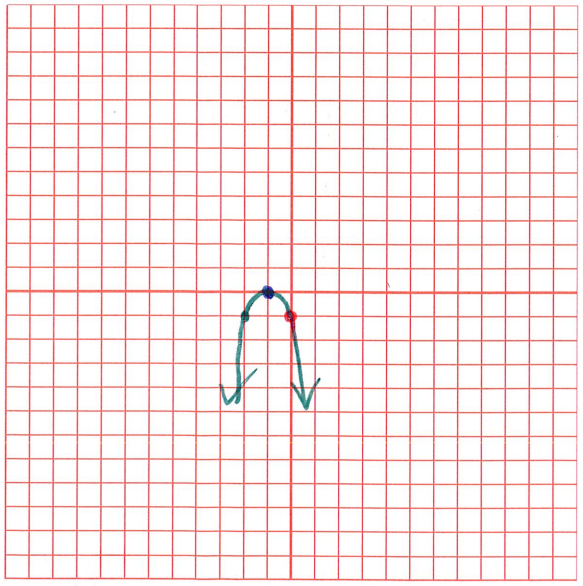
$x = -1$ Mult 6 love tap even mult

y-intercept Set $x = 0$

$y = -1(0+1)^6$ $(0, -1)$

$y = -1(1)$

$y = -1$



#10 $f(x) = -6x^3 + 7x^2 (-1)$ John Travolta w/ left hand

P Pool $\frac{\pm 1}{\pm 1 \pm 2 \pm 3 \pm 6}$ $\pm 1 \pm \frac{1}{2} \pm \frac{1}{3} \pm \frac{1}{6}$

9

Put in Calc to find

$x = 1$ Root $(x-1)$ factor

1	-6	7	0	-1
	↓	-6	1	1
	-6	1	1	0

$(x-1)(-6x^2+1x+1) = 0$

$x = 1$ factor

$-6x^2 + 3x - 2x + 1$ $3, -2$ $-6, 1$

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

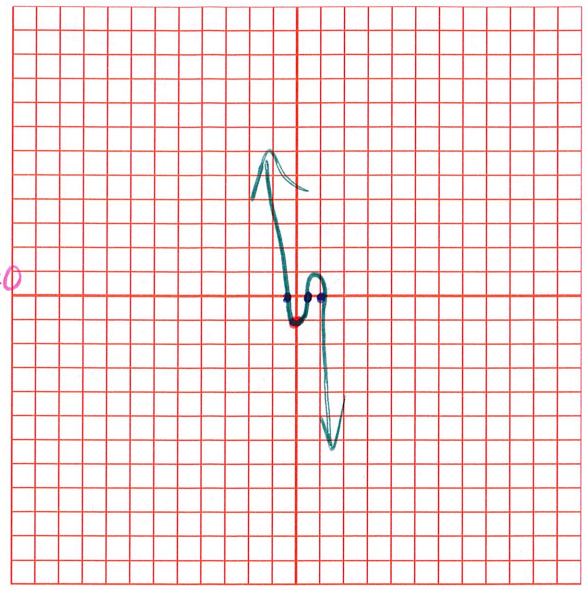
$(-3x-1)(2x-1)$

$x = -\frac{1}{3}$

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

$x = 1$

y-intercept $(0, -1)$



#11 $f(x) = 2x^3 - 2x$ Cubic John Travolta right hand

factor

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

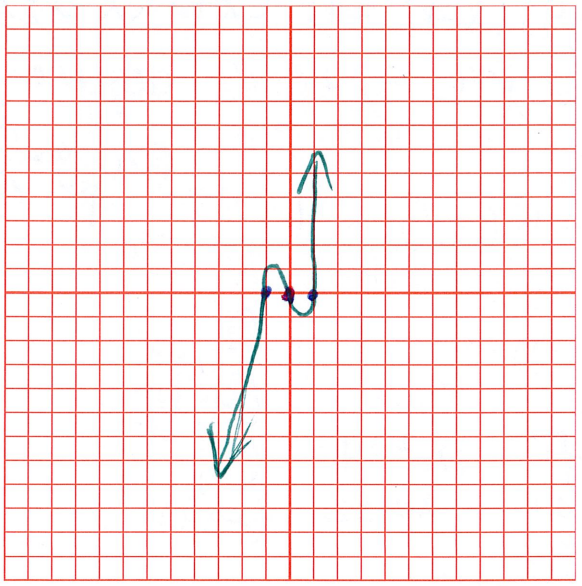
$0 = 2x(x+1)(x-1)$

$x = 0$

$x = 1$

$x = 1$

y-intercept $(0, 0)$



#12

$f(x) = x^3 - 2x^2 + 26x$

John Travolta right hand

factor

$0 = x(x^2 - 2x + 26)$

$x = 0$

Complete the Square

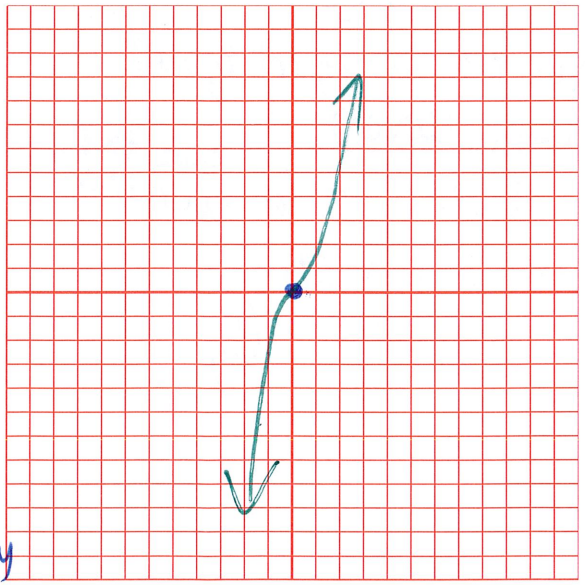
$x^2 - 2x + \square = -26 + \square$

$\sqrt{(x-1)^2} = \sqrt{-25}$

$x - 1 = \pm 5i$

$x = 1 \pm 5i$ 2 imaginary roots

$x = 0$ 1 IR root



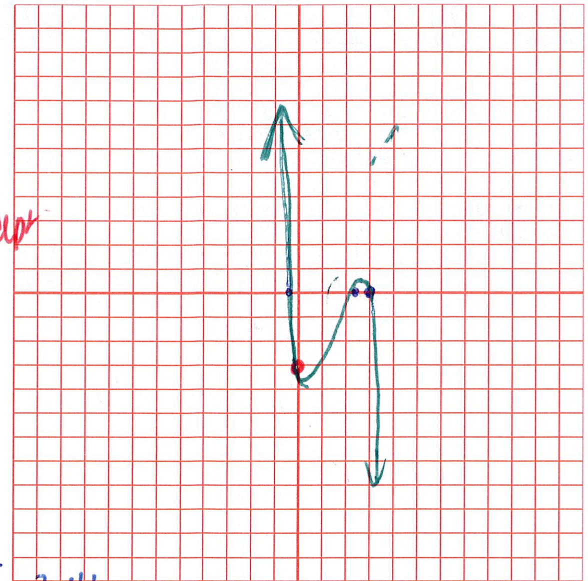
#13 $f(x) = -x^3 + 5x^2 - 5x - 3$ John Travolta w/ left hand Pg. 5,6

Pool $\frac{p}{q}$ $\frac{\pm 1 \pm 3}{\pm 1}$ ± 1, ± 3

graph on Calc

$x = 3$ root $(x-3)$ factor

y-intercept $(0,-3)$



3	-1	5	-5	-3
	↓	-3	6	3
	-1	2	1	0

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

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

$x^2 - 2x + \boxed{1} = 1 + \boxed{1}$

$\sqrt{(x-1)^2} = \sqrt{2}$

$x = 1 \pm \sqrt{2}$

$x = 3$

$x = 1 + \sqrt{2}$ 2.41

$x = 1 - \sqrt{2}$ -.41

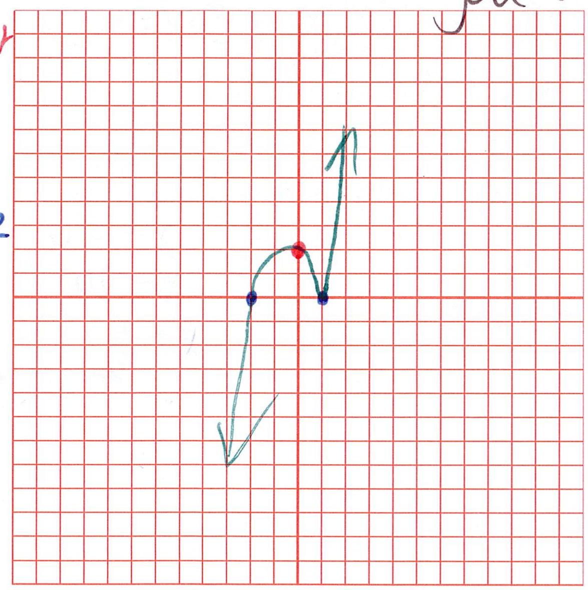
Solve Each

#14 $x^3 - 3x + 2 = 0$ y-intercept $(0,2)$

$\frac{p}{q}$ $\frac{\pm 1 \pm 2}{\pm 1}$ ± 1, ± 2

$x = -2$

$x = 1$ Mult 2 love tap



You don't have to graph I just did so you could see

-2	1	0	-3	2
	↓	-2	4	-2
	1	-2	1	0

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

$(x+2)(x-1)(x-1)$

$x = -2$ $x = 1$ Mult 2

#15

$6x^3 - 11x^2 + 6x - 1 = 0$

$\frac{p}{q}$ $\frac{\pm 1}{\pm 1 \pm 2 \pm 3 \pm 6}$ ± 1, $\pm \frac{1}{2}$, $\pm \frac{1}{3}$, $\pm \frac{1}{6}$

$x = 1$ root

factor 6, -2, -3, -5

1	6	-11	6	-1
	↓	6	-5	1
	6	-5	1	0

$(x-1)(6x^2-5x+1)$

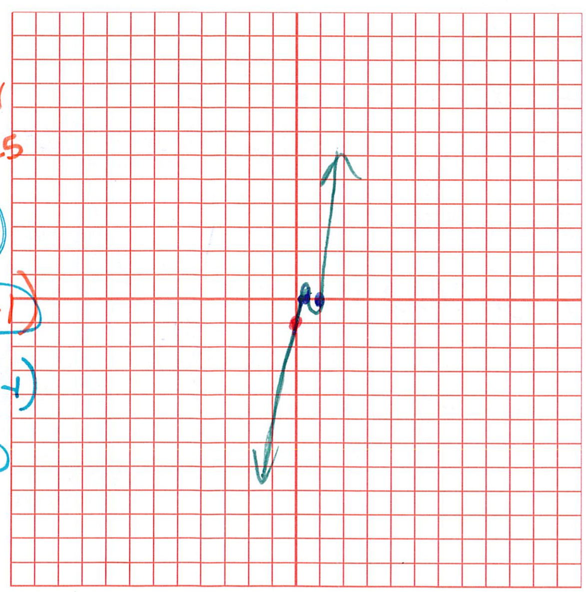
$(x-1)(6x^2-3x-2x+1)$

$(x-1)(3x(2x-1)-1(2x-1))$

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

$x = 1$ $x = \frac{1}{3}$ $x = \frac{1}{2}$

y-inter $(0,-1)$



#16 Should have 5 roots degree 5

$(2x+1)(3x-2)^3(2x-7)=0$

$x=-\frac{1}{2}$ $x=\frac{2}{3}$ Mult 3

$x=\frac{7}{2}=3\frac{1}{2}$

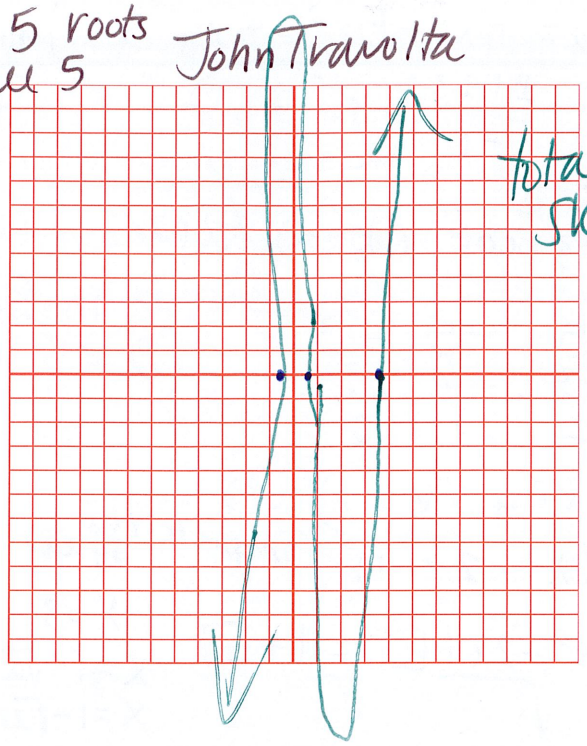
y-intercept

$(2(0)+1)(3(0)-2)^3(2(0)-7)$

$(1)(-8)(-7)$

56 $(0, 56)$

John Travolta



total sketch :)

#17

$2x^3+5x^2-200x-500=0$

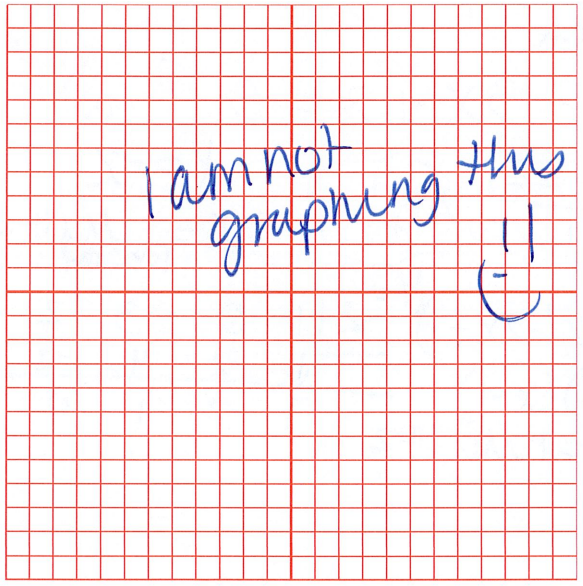
Box & Circle factor

$x^2(2x+5)-100(2x+5)=0$

$(x^2-100)(2x+5)=0$

$(x+10)(x-10)(2x+5)=0$

$x=-10$ $x=10$ $x=-\frac{5}{2}$



I am not graphing this one :)

#18 $x^4-x^3-11x^2=x+12$

Set = to 0

$x^4-x^3-11x^2-x-12=0$

$\frac{p}{q}$ $\pm1\ \pm2\ \pm3\ \pm4\ \pm6\ \pm12$

$\frac{\pm1\ \pm2\ \pm3\ \pm4\ \pm6\ \pm12}{\pm1}$

$x=-3$ on calc is a root factor $(x+3)$

-3	1	-1	-11	-1	-12
		-3	12	-3	12
	1	-4	1	-4	0

$(x+3)(x^3-4x^2+1x-4)$

$\frac{p}{q}$ $\frac{\pm1\ \pm2\ \pm4}{\pm1}$

$x=4$ root $(x-4)$

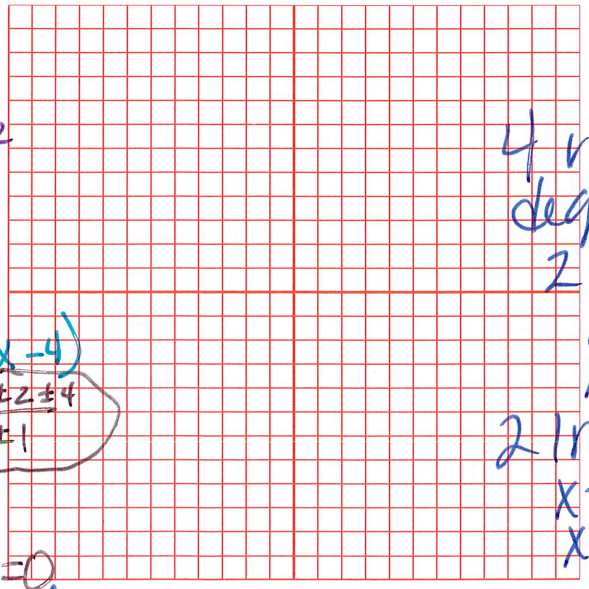
4	1	-4	1	-4
		4	0	4
	1	0	1	0

factors $(x+3)(x-4)(x^2+1)=0$

$x=-3$ $x=4$ $x=i$ $x=-i$

↑ solve for x

$x^2+1=0$ $\sqrt{x^2}=\sqrt{-1}$ $x=\pm i$



4 roots

degree of 4

2 Real Roots

$x=-3$

$x=4$

2 Imag

$x=i$

$x=-i$

#19 $2x^4+x^3-17x^2-4x+6=0$

$\frac{p}{q}$ $\frac{\pm1\ \pm2\ \pm3\ \pm6}{\pm1\ \pm2}$ $\pm1\ \pm\frac{1}{2}\ \pm2\ \pm3\ \pm\frac{3}{2}\ \pm6$ on Calc $x=-3$ root

$(x+3)$ factor

-3	2	1	-17	-4	6
		-6	15	6	-6
	2	-5	-2	2	0

$(x+3)(2x^3-5x^2-2x+2)$ no do it again

$\frac{p}{q}$ $\frac{\pm1\ \pm2}{\pm1\ \pm2}$ $\pm1\ \pm\frac{1}{2}\ \pm2$ on Calc $x=\frac{1}{2}$ factor $(x-\frac{1}{2})$

$\frac{1}{2}$	2	-5	-2	2
		1	-2	2
	2	-4	-4	0

$(x+3)(x-\frac{1}{2})(2x^2-4x-4)=0$ ↑ now factor

$x=3$ $x=\frac{1}{2}$ $x=1-\sqrt{3}$ $x=1+\sqrt{3}$ all 4 roots

$2(x^2-2x-2)=0$ ↑ complete the square

$x^2-2x+1=2+1$

$(x-1)^2=3$

$x-1=\pm\sqrt{3}$

$x=1\pm\sqrt{3}$

#20 $p(x)=-x^2+150x-4425$

$x=$ # Cabinets Sold per day

$P(x)=$ daily profit → x

a) How many cabinets should they sell to MAXIMIZE their profits $P(x)$

all you need to do is find your Vertex

$\left(\frac{-b}{2a}, P(c)\right)$

$\frac{-150}{2(-1)}$ $(75, \$1200)$

$-1(75)^2+150(75)-4425$

$-5625+11250-4425$

6750

If you sell 75 Cabinets per day you will Maximize your profit of $1200.

#21 pairs of #'s whose sum is -18
Maximize the product

X is first # then second # is

$X + (\quad) = -18$

Second # = $-18 - X$

$X(-18 - X) = f(x)$

$-18x + x^2 = f(x)$

$-x^2 - 18x = f(x)$

$-(-9)^2 - 18(-9) =$

$-81 + 162$

81

find Vertex (Maximum) $\left(\frac{-b}{2a}, p;c\right)$

$\frac{18}{2(-1)}$ $(-9, 81)$

First # is going to be -9

Second # $-18 - (-9)$

$-18 + 9$

Second # is → -9

Watch

$(-9) + (-9) = -18$

Sum is -18

Product is the Max

$(-9)(-9) = 81$

Two numbers are -9 & -9.

#22

X = height of triangle

base = $40 - 2X$

$A = \frac{1}{2} b \cdot h$

$A(x) = \frac{1}{2}(40 - 2x)X$

$A(x) = \frac{1}{2}x(40 - 2x)$

$A(x) = 20x - 1x^2$

$A(x) = -x^2 + 20x$

Now find Vertex

$\left(\frac{-b}{2a}, p;c\right)$

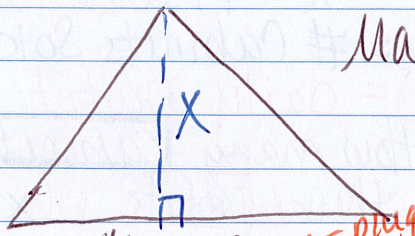
height → max area

$\frac{-20}{2(-1)}$

$-1(10)^2 + 20(10)$

$-100 + 200$

100



Maximize the

plug in to find base

$40 - 2(10)$

So if the height of the triangle is 10 inches the base would be 20 which would give you a max area of (10, 100) 100 square inches

You must long divide only this one

#23 $\dfrac{16x^4-3x^3-11x^2+2x+4}{3x^2-1}$

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

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

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

$$3x^2+0x-1 \;\overline{)\;16x^4-3x^3-11x^2+2x+4}$$

$$2x^2-x+3$$

$$-(16x^4+0x^3-2x^2)$$

$$-3x^3+9x^2+2x$$

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

$$9x^2+1x+4$$

$$-(9x^2+0x-3)$$

$$1x+1 \quad \text{Remainder}$$

Answer $2x^2-x+3+\dfrac{x+1}{3x^2-1}$

#24 you can Synthetic divide $\dfrac{2x^4-13x^3+17x^2+18x-24}{x-4}$

4	2	-13	17	18	-24
	↓	8	-20	-12	24
	2	-5	-3	6	0

Answer $2x^3-5x^2-3x+6$

#25 n=3 means degree is 3 you know the roots

$x=1$ and $x=i$ $x=-i$

So the factors are

$(x-1)(x-i)(x--i)$

$(x-1)(x-i)(x+i)$

$x^2+xi-xi-i^2$

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

x^3+x-x^2-1

x^3-x^2+x-1

this Will not be on quiz

You know $f(-1)=8$

$(-1,8)$

$8=(-1)^3-(-1)^2+(-1)-1 \quad a_n=-2$

$8=-1-1-1-1\,(a_n)$

$8=-4(a_n)$

Answer

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

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

not on quiz

#26 $n=4$ degree is 4 So 4 Roots

$x=2$ Mult 2 $\quad 3i$ is a root so is $-3i$

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

$(x-3i)(x+3i)$ $\quad x^2+3xi-3xi-9i^2$, $i^2=-1$

$(x^2-4x+4)(x^2+9)$

$x^4+9x^2-4x^3-36x+4x^2+36$

$f(0)=36$

$f(x)=x^4-4x^3+13x^2-36x+36$ answer

$a_n=1$

$y=a_n(x-2)^2(x^2+9)$

$36=a_n(0-2)^2(0^2+9)$

$36=a_n(4)(9)$

$\frac{36}{36}=\frac{36a_n}{36}$

$1=a_n$

#27 Does $f(x)=x^3-x-5$ have a root between 1 & 2

Use $f(1)=(1)^3-(1)-5=1-1-5=-5$

$(1,-5)$

$f(2)=(2)^3-(2)-5$

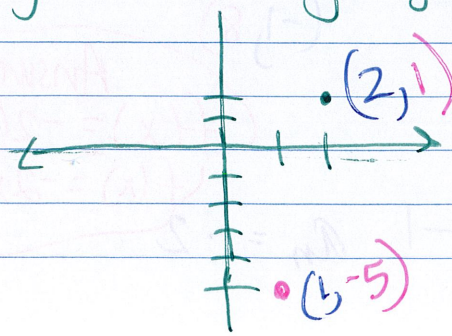
$8-2-5$

$6-5$

1

$(2,1)$

Yes there must be a root between 1 & 2 because when you plug in $x=1$ you get -5 and when you plug in $x=2$ you get 1. So



It has to cross x-axis somewhere in between??