Thurs 4/2 Problems (8-17 → 8-25) From 8.1.1

8-17) a) Yes a Polynomial
b) yes
c) No; the exponent is a variable
d) yes
e) yes
f) No → the y is squared
g) No → exponent in the denominator
h) Yes
i) yes
j) yes = horizontal line

8-18) No ; test with → $x = 4$ then $y =$
$(y-3)^2 = 25$
$y - 3 = \pm 5$
$y = 8$ and $y = -2$

and $(\cancel{4-4}) + (y-3) = 5$
$y - 3 = 5$
$y = 8$ but not -2

Also $(x-4) + (y-3) = 5$ simplifies to $y = -x + 12$
This is a line and not a circle!

8-19) a) $y = x^2 - 6x + 8$ $\quad x = 2$
$y = (x-4)(x-2)$ $\quad x = 4$

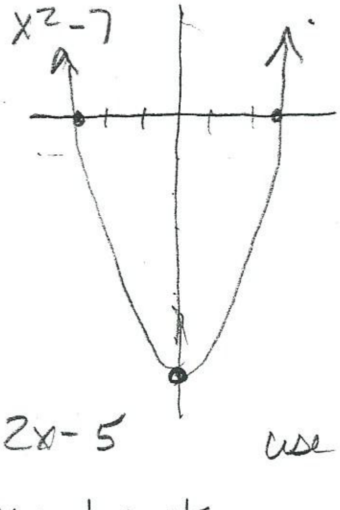
b) $f(x) = x^2 - 6x + 9$ $\quad x = 3$
$f(x) = (x-3)(x-3)$

c) $y = x^3 - 4x = x(x^2 - 4) = x(x-2)(x+2)$
$x = 0,\ x = 2,\ x = -2$

8-20) $y = x^2 - 7$

vertex $(0, -7)$

$x = \pm\sqrt{7}$



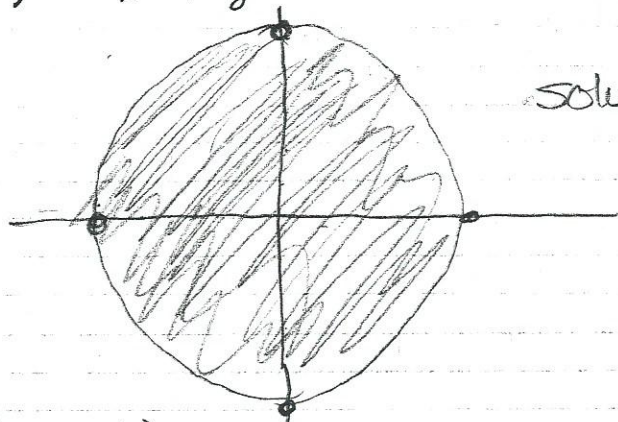
a) 2 roots (2 x-intercepts)
b) $x = \sqrt{7}$
$x = -\sqrt{7}$

8-21) $x^2 + 2x - 5$ use Quad Formula

$$\frac{-2 \pm \sqrt{2^2 - 4(1)(-5)}}{2} = \frac{-2 \pm \sqrt{4 + 20}}{2} = \frac{-2 \pm \sqrt{24}}{2} = \frac{-2 \pm 2\sqrt{6}}{2} = -1 \pm \sqrt{6}$$

a) 2 x-intercepts
b) $-1 + \sqrt{6} = 1.4$
$-1 - \sqrt{6} = 3.4$

8-22) $x^2+y^2 \le 25$ (circle) $r=5$
center $=0,0$



solution: values inside and on the circle

8-23) $2^{p(x)}=4$ $\quad p(x)=x^2-4x-3$

$\log 2^{p(x)} = \log 4$ $\quad p(x)=\frac{\log 4}{\log 2}=2$

$p(x)\log 2=\log 4$

$x^2-4x-3=2$

$x^2-4x-5=0$

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

$\boxed{\begin{array}{c} x=5 \\ x=-1 \end{array}}$

8-24) $y=3^x$

a) Down 4 units $y=3^x-4$

b) Right 7 units $y=3^{(x-7)}$

8-25)

x	-90°	-45°	0°	45	90	135	180	...	270
y	-30'	-21	0	21	30	21	0		-30

$\sin 45 = \frac{x}{30}$

$x=30\sin 45=-21$

a) Repeat the pattern for several cycles

b) 30'

c) $y=30\sin x$

Tues/Wed 4/7 & 4/8 8.1.2 & 8.1.3 (8-36 → 8-44
8-54 → 8-62)

8-36) $0 = (x+3)^2 - 5$

$0 = x^2 + 6x + 9 - 5$

$x^2 + 6x + 4$

$\frac{-6 \pm \sqrt{6^2 - 4(1)(4)}}{2} = \frac{-6 \pm \sqrt{36 - 16}}{2}$

$\frac{-6 \pm \sqrt{20}}{2} = \frac{-6 \pm 2\sqrt{5}}{2} = \boxed{-3 \pm \sqrt{5}}$

8-37) $(x+29) = 0$ $(x-74)^2 = 0$

$x = -29$ $x = 74$

$(-29, 0)$ $(74, 0)$ ⇐ double root

8-38) $(-3,0)$ $(2,0)$

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

$y = x^2 - 2x + 3x - 6$

$\boxed{y = x^2 + x - 6}$

$(-3,0)$ $(\frac{1}{2}, 0)$

$y = (x+3)(x - \frac{1}{2})$

change to $(2x - 1)$ by mult by 2

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

$y = 2x^2 - x + 6x - 3$

$\boxed{y = 2x^2 + 5x - 3}$

8-39) a) 2 c) 3

b) 5 d) 6

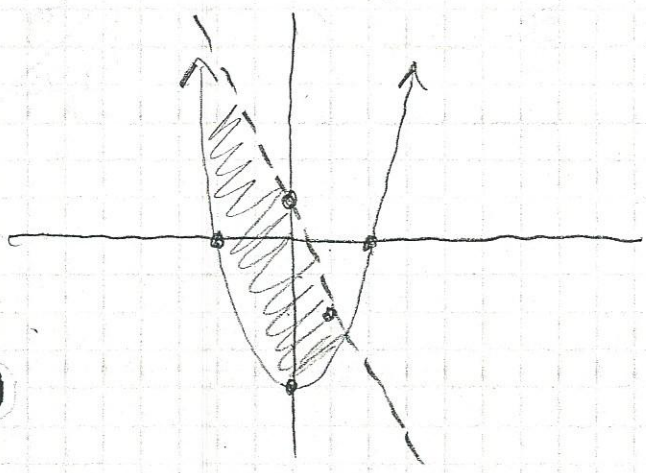
8-40) Lines, parabolas and cubics are polynomial functions because they can be written in the form $y = ax^n$.

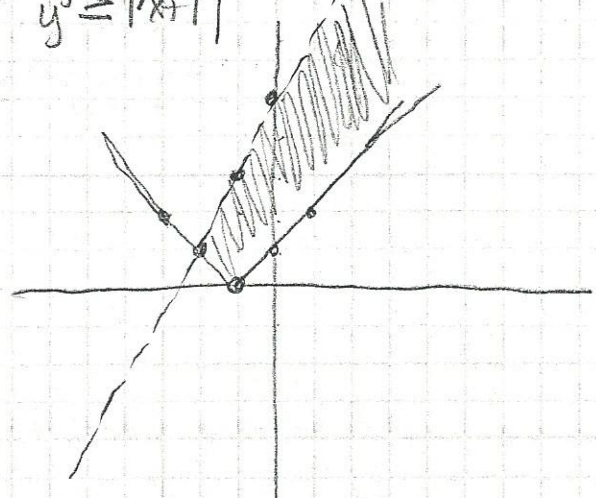
Circles are not functions & can't be written in $y=$ form they fail the vertical line test

Exponentials are not polynomials because the exponent is a variable x

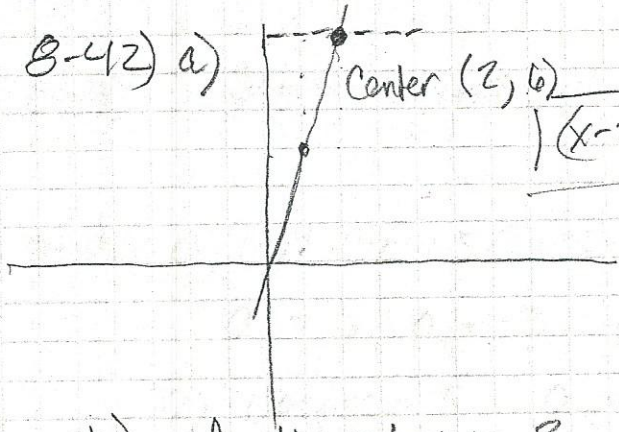
8-41) a) $y \geq x^2 - 4$
$y < -3x + 1$

b) $y < 2x + 5$
$y \geq |x+1|$





8-42) a)



Center (2, 6)

$\boxed{(x-2)^2 + (y-6)^2 = 4}$

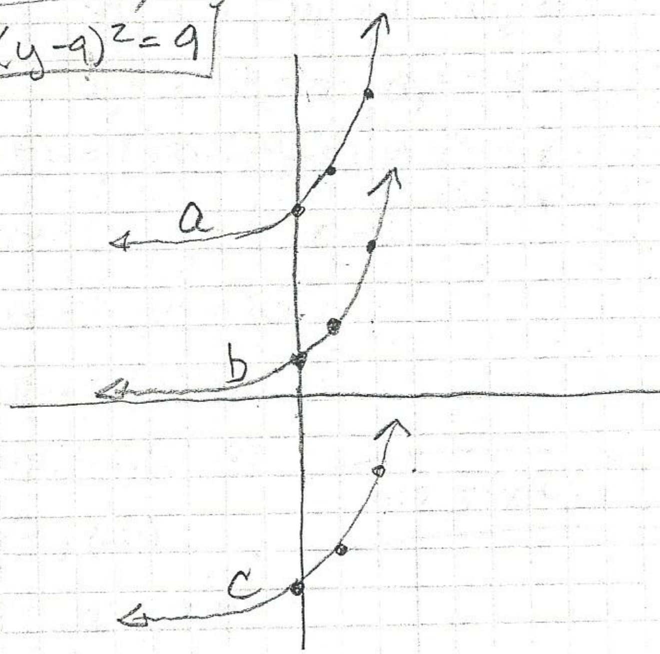
b) if the radius is 3, y is 9 so

$\boxed{(x-3)^2 + (y-9)^2 = 9}$

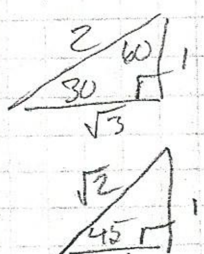
8-43) a) $y = 2^x$

b) $y = 2^x + 5$

c $y = 2^x - 5$



8-44) a) $\sin\theta = \frac{1}{2}$ 30° & 150°



b) $\tan\theta = \sqrt{3}$ 60° & 240°

c) $\cos\theta = \frac{\sqrt{3}}{2}$ 30° & 333°

d) $\sin\theta = -\frac{\sqrt{2}}{2}$ 225° & 315°

8-54) $f(x) = -2(x+2)^2(x-1)$ Stretch factor is -2 to make the function fit the graph

8-55) a) $6x^4 - 3x^3 + 5x^2 + x + 8$ degree = 4

$a_4 = 6 \quad a_3 = -3 \quad a_2 = 5 \quad a_1 = 1 \quad a_0 = 8$

b) degree = 3 $\quad a_3 = -5 \quad a_2 = 10 \quad a_1 = 0 \quad a_0 = 8$

c) degree = 2 $\quad a_2 = -1 \quad a_1 = 1 \quad a_0 = 0$

d) degree = 3 $\quad a_3 = 1 \quad a_2 = -8 \quad a_1 = -15 \quad a_0 = 0$

$x(x-3)(x-5) = (x^2-3x)(x-5) = x^3 - 5x^2 - 3x^2 - 15x$

$x^3 - 8x^2 - 15x$

e) x degree = 1 $\quad a_1 = 1 \quad a_0 = 0$

f) 10 degree = 0 $\quad a_0 = 10$

8-56) $y = a(x+4)(x-1)(x-3)$

$60 = a(-1+4)(-1-1)(-1-3)$

$60 = a(+3)(-2)(-4)$

$\frac{60}{24} = \frac{a(+24)}{+24} \quad a = 2.5$

$\boxed{y = 2.5(x+4)(x-1)(x-3)}$

8-57) a) $y = (x+2)(x-3/4)$ $\quad y = 4x^2 - 3x + 8x - 6$

$y = (x+2)(4x-3)$ $\quad \boxed{y = 4x^2 + 5x - 6}$

b) $y = (x+\sqrt{5})(x-\sqrt{5})$

$y = x^2 - \cancel{x\sqrt{5}} + \cancel{x\sqrt{5}} - \sqrt{25}$

$\boxed{y = x^2 - 5}$

8-58) $\sqrt{5-2x} + 7 = 4$

$\quad\quad -7 \quad -7$

$\sqrt{5-2x} = -3$

$\varnothing$ A radical can never be equal to a negative number

8-59) a) $(y-7)^2+(x-3)^2=25$ $C(7,3)$ $R=5$

b) $x^2 + y^2+10y+25=-9+25$

$(x-0)^2+(y+5)^2=16$ $C(0,-5)$ $R=4$

c) $x^2+18x+81+y^2-8y+16=-47+81+16$

$(x+9)^2+(y-4)^2=50$ $C(-9,4)$ $R=\sqrt{50}=5\sqrt{2}$

d) $(y-0)^2+(x-3)^2=1$ $C(3,0)$ $R=1$

8-60) a) $2^x=17$ $\log 2^x=\log 17$

$x\log 2=\log 17$

$\boxed{x=\log 17/\log 2}$

b) $\log_3(x+1)=5$ $3^5=x+1$

$243=x+1$

$\boxed{242=x}$

c) $\log_3(3^x)=4$ $3^4=3^x$

$\boxed{x=4}$

d) $4^{\log_4(x)}=7$ $\log_4 7=\log_4(x)$

$\boxed{x=7}$

8-61) a) $|2x+1|<5$

$2x+1<5$ $2x+1>-5$

$2x<4$

$x<2$ and $2x>-6$

$x>-3$

$\boxed{-3<x<2}$

b) $2|3x-2|\geq 10$

$|3x-2|\geq 5$

$3x-2\geq 5$ OR $3x-2\leq -5$

$3x\geq 7$ $3x\leq -3$

$\boxed{x\geq 7/3}$ $\boxed{\text{OR}}$ $\boxed{x\leq -1}$

8-62) $y = 4\sin x + 2$ shifted up 2 units and amplitude is 4

Thurs 4/9 8.2.1 (8-70 thru 8-78)

8-70) a) $-18 - \sqrt{25} = -18 - 5i$

b) $\dfrac{2 \pm \sqrt{-16}}{2} = \dfrac{2 \pm 4i}{2} = 1 \pm 2i$

c) $5 + \sqrt{-6} = 5 + i\sqrt{6}$

8-71) $i^3 = -i \Rightarrow i^3 = i^2 \cdot i = -1 \cdot i = -i$

$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$

8-72) $f(x) = x^2 + 7x - 9$

a) $f(-3) = (-3)^2 + 7(-3) - 9 = 9 - 21 - 9 = \boxed{-21}$

b) $f(i) = (i)^2 + 7i - 9 = -1 + 7i - 9 = \boxed{-10 + 7i}$

c) $f(-3+i) = (-3+i)^2 + 7(-3+i) - 9$

$9 - \cancel{3i} + \cancel{3i} + i^2 - 21 + 7i - 9$

$\cancel{9} - 1 - 21 + 7i - \cancel{9} = \boxed{-22 + 7i}$

8-73) $x^2 - 10x + 29 = 0$

$\dfrac{10 \pm \sqrt{100 - 4(1)(29)}}{2} = \dfrac{10 \pm \sqrt{100 - 116}}{2} = \dfrac{10 \pm \sqrt{-16}}{2}$

$\dfrac{10 \pm 4i}{2} = 5 \pm 2i$ yes it is a solution!

8-74) $16^{(x+2)} = 8^x$

$2^{4(x+2)} = 2^{3x}$ $4x + 8 = 3x$

$\boxed{x = -8}$

8-75) $(x-5)^2 = x^2 - 10x + 25$ ✓

$(5-x)^2 = 25 - 5x - 5x + x^2 = x^2 - 10x + 25$

$(5-x)(5-x)$ Yes, equivalent