Math 112 $(x+y)^5 = x^5 + 5x^4y^1 + 10x^3y^2 + 10x^2y^3 + 5xy^4 + y^5$

Q's $\left(5x^2 - \frac{1}{x}\right)^5$

Know: $(\square + \triangle)^5 = \square^5 + 5\square^4\triangle + 10\square^3\triangle^2 + 10\square^2\triangle^3 + 5\square\triangle^4 + \triangle^5$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
$\boxed{1 \quad 5 \quad 10 \quad 10 \quad 5 \quad 1}$

$(\square + \triangle)^5 = \square^5 + 5\square^4\triangle + 10\square^3\triangle^2 + 10\square^2\triangle^3 + 5\square\triangle^4 + \triangle^5$

$\left((5x^2) + \left(-\frac{1}{x}\right)\right)^5 = \underbrace{(5x^2)^5}_{(1)} + \underbrace{5(5x^2)^4\left(-\frac{1}{x}\right)^1}_{(2)} + \underbrace{10(5x^2)^3\left(-\frac{1}{x}\right)^2}_{(3)} + \underbrace{10(5x^2)^2\left(-\frac{1}{x}\right)^3}_{(4)} + \underbrace{5(5x^2)\left(-\frac{1}{x}\right)^4}_{5} + \left(-\frac{1}{x}\right)^5$

$= 3125x^{10} - 3125x^7 + \boxed{1250}x^4 - 250x + 25x^{-2} - x^{-5}$

(2) $5(5x^2)^4\left(-\frac{1}{x}\right) = \frac{-5 \cdot 5^4 x^8}{x} = -3125x^7$

(3) $10(5x^2)^3\left(\frac{-1}{x}\right)^2 = \frac{10 \cdot 5^3 \cdot x^6}{x^2} = 1250x^4$

(4) $10(5x^2)^2\left(\frac{-1}{x}\right)^3 = -\frac{10 \cdot 5^2 x^4}{x^3} = -250x$

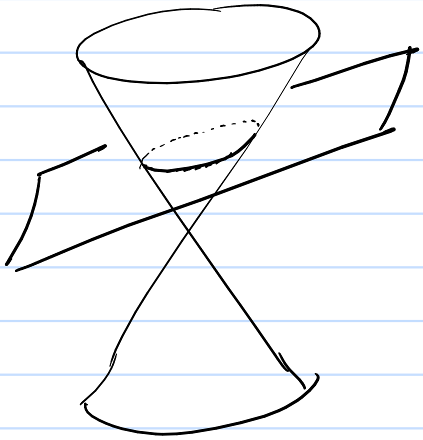
(5) $5(5x^2)\left(-\frac{1}{x}\right)^4 = \frac{25x^2}{x^4} = 25x^{-2}$

(*) $10(5x^2)^3\left(\frac{-1}{x}\right)^2 =$

Conic Sections

- circles
- ellipses
- parabolas
- hyperbolas

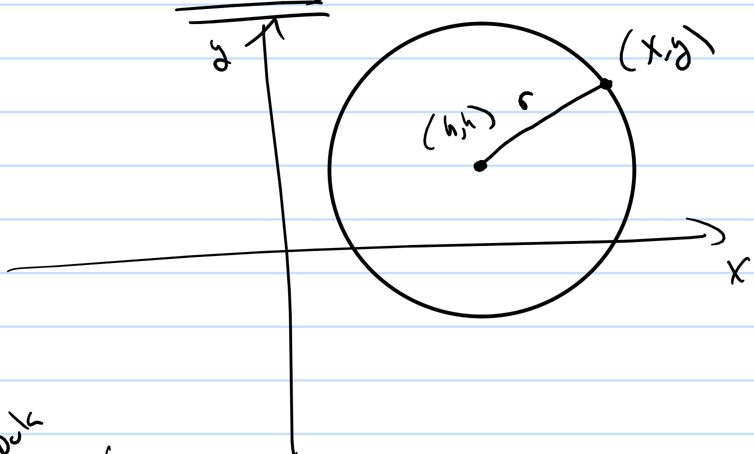
3D reason for existing



2D equns for curves

center (h, k)
radius r

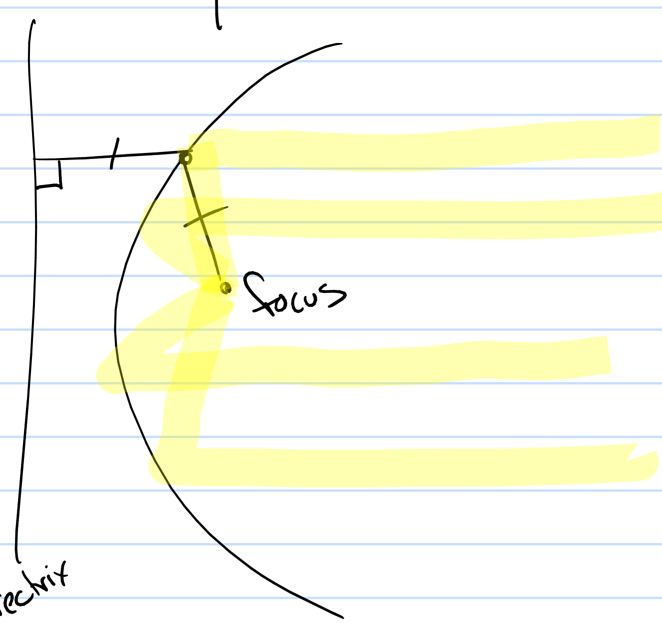
7.2 Circles



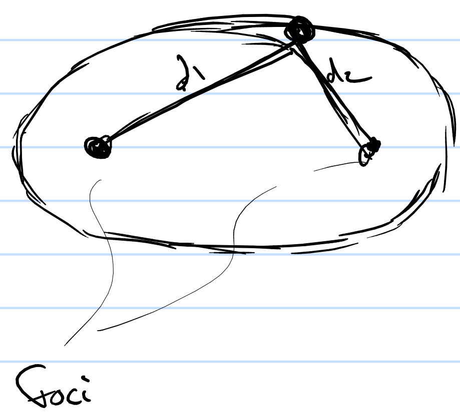
(x,y) are all points that are equidistant from center

distance = radius.

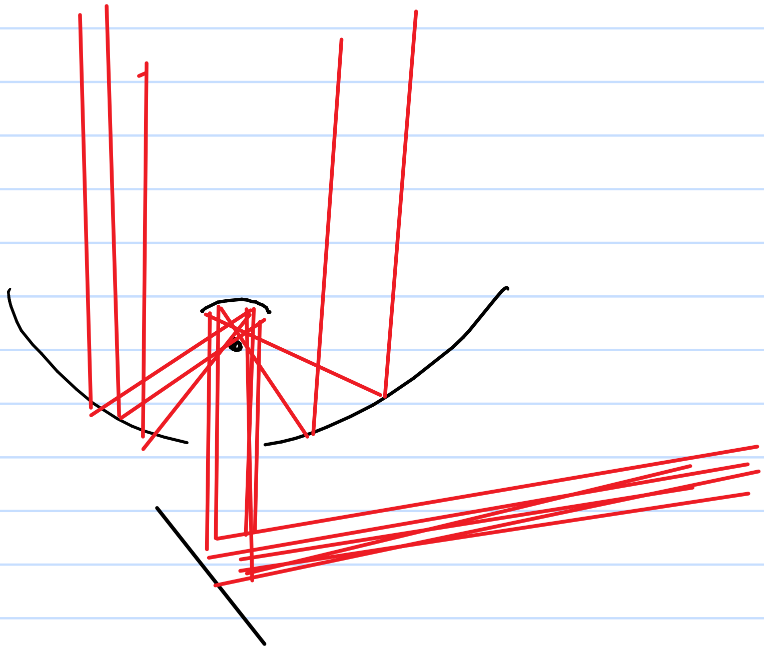
parabola



$d_1 + d_2 = \text{const}$

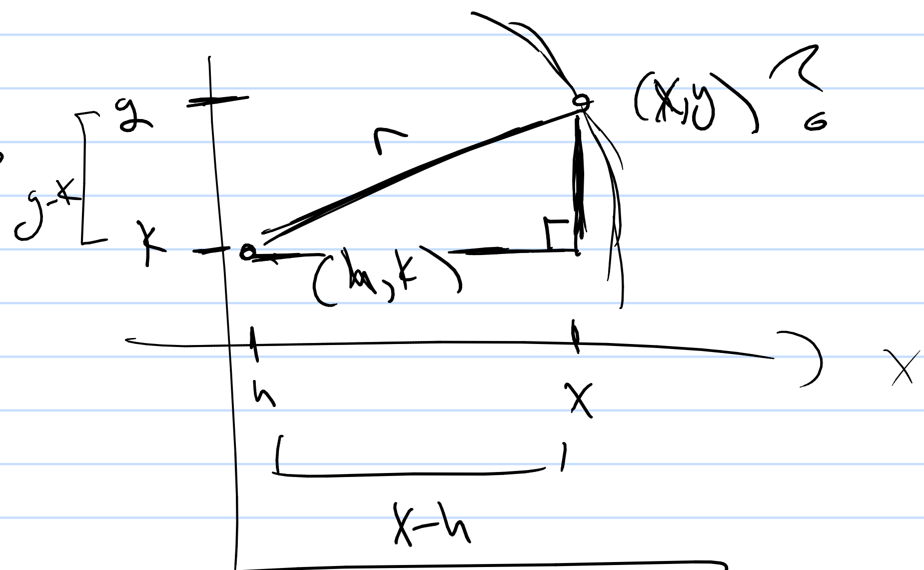


ellipse



Circle

h, k, r are constants



$$\boxed{(x-h)^2 + (y-k)^2 = r^2}$$ eqn of a circle

Ex Circle centered @ $(-1, 3)$ with $r = 4$

$$\boxed{(x+1)^2 + (y-3)^2 = 16}$$

(ex) $(x+3)^2 + (y+1)^2 = 36$

Circle with center $(-3,-1)$ radius $= 6$

(ex) $(x+2)^2 + (y-4)^2 = 5$

Circle with center $(-2,4)$ radius $= \sqrt{5}$

(ex) $x^2 + (y^2 - 2y + 1) = 4$

$(x-h)^2 + (y-k)^2 = r^2$

$(y^2 - 2ky + k^2)$

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

$$\boxed{x^2 + (y-1)^2 = 4}$$

circle; center $(0,1)$; $r = 2$

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

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

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

ex $x^2+6x+y^2-10y=0$

$x^2+6x+(3)^2+y^2-10y+(5)^2 = 3^2+5^2$

$(x+3)^2+(y-5)^2=34$

circle: center is $(-3,5)$

radius is $\sqrt{34}$

---

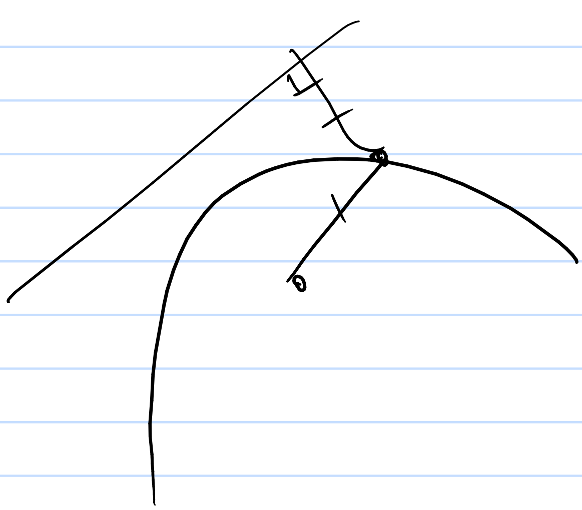
ex $\dfrac{3x^2+12x+3y^2}{3}=\dfrac{2}{3}$

$x^2+4x+y^2=2/3$

$x^2+4x+(2)^2+y^2=2/3+(2)^2$

$(x+2)^2+y^2=\frac{14}{3}$

circle: center is $(-2,0)$
radius is $\sqrt{14/3}$



Q $4+8+16+32+\dots+1024$

on Sums

Step 1 Find:

Seq: $4, 8, 16, 32, 64, 128, 256, 512, 1024$

$\times 2$

$2^2, 2^3, 2^4, 2^5, 2^6, 2^7, 2^8, 2^9, 2^{10}$

Finding the Seq.

$\{2^k\}$ $k = 2, 3, 4, 5, 6, 7, 8, 9, 10$

$$\sum_{k=2}^{10} 2^k$$

a sum is an addition of a seq

ex $1+3+9+27+81$

Seq?: $1, 3, 9, 27, 81$ ($\times 3$, $\times 3$)

$3^0, 3^1, 3^2, 3^3, 3^4$

Seq $\{3^k\}$ $k=0,1,2,3,4$

$$\boxed{\sum_{k=0}^{4} 3^k}$$

ex $1+3+5+7+9+11+13$

Seq?: $1, 3, 5, 7, 9, 11, 13$ ($+2$ $+2$ $+2$) arithmetic

$1, 1+2, 1+2\cdot2, 1+3\cdot2, \dots, \underbrace{1+6\cdot2}_{13}$

$1, 1+1\cdot2, 1+2\cdot2, 1+3\cdot2, 1+4\cdot2,$
$1+5\cdot2, 1+6\cdot2$

Seq: $\{1+2\cdot k\}$ $k=0,1,2,3,\dots,6$

$$\boxed{\sum_{k=0}^{6} 1+2k}$$