Parabolas, Circles, and Ellipses (Conic Sections)

Parabolas: $y = ax^2 + bx + c$

y-int: c (exactly 1)

x-int: Solve Quadratic eq: $ax^2+bx+c=0$

May have 0, 1, or 2 x-intercepts.

Vertex: $x = -b/2a$, $y = c - b^2/4a$

Opens: up if $a>0$, down if $a<0$

eg Graph $y = x^2 - 7x + 12$ $a=1$ $(a>0)$ $\Rightarrow$ opens up. ∪

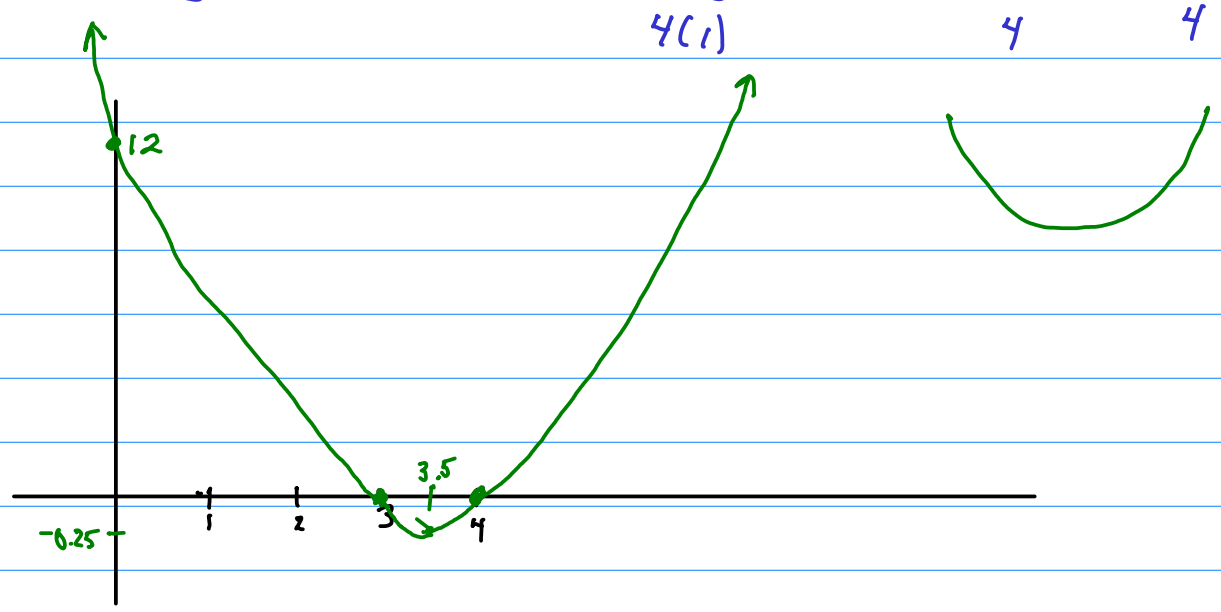
① y-int: $c = \boxed{12}$

② x-int: $x^2 - 7x + 12 = 0$ $(x-4)(x-3) = 0$ $\boxed{x=4,\ x=3}$

③ vertex: $x = \frac{-b}{2a} = \frac{-(-7)}{2(1)} = \frac{7}{2}$ or $\boxed{3.5}$

$y = c - b^2/4a = 12 - \frac{(-7)^2}{4(1)} = 12 - \frac{49}{4} = -\frac{1}{4} = \boxed{-.025}$

∪



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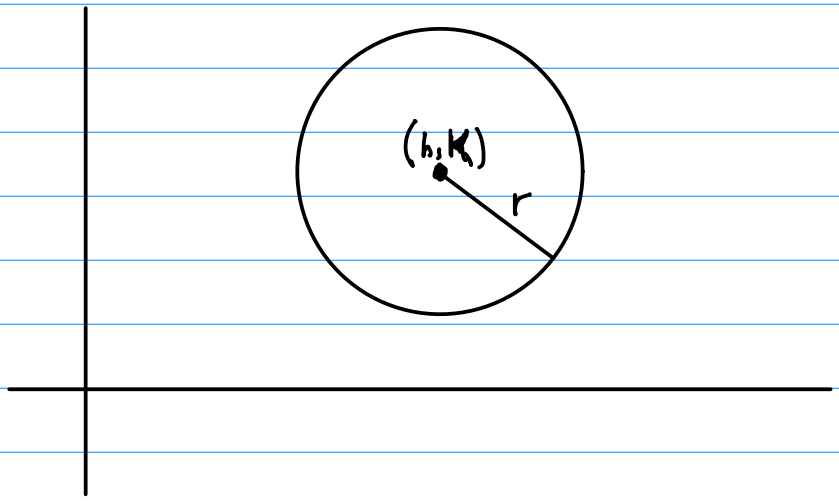
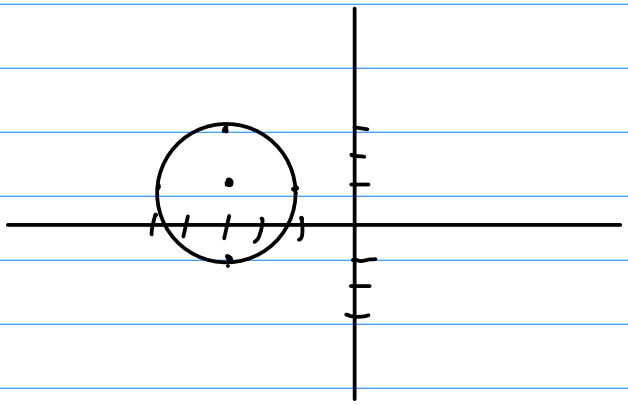
Circles



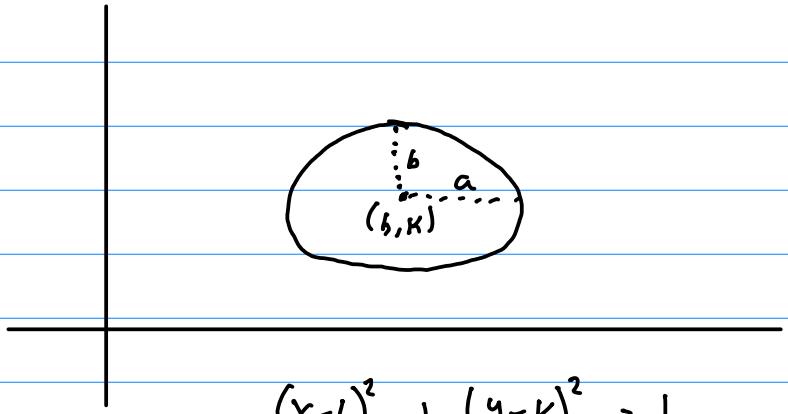
$$(x-h)^2 + (y-K)^2 = r^2$$

eg Graph $(x+3)^2 + (y-1)^2 = 4$

Centre: $(-3,1)$, $r = \sqrt{4} = 2$.

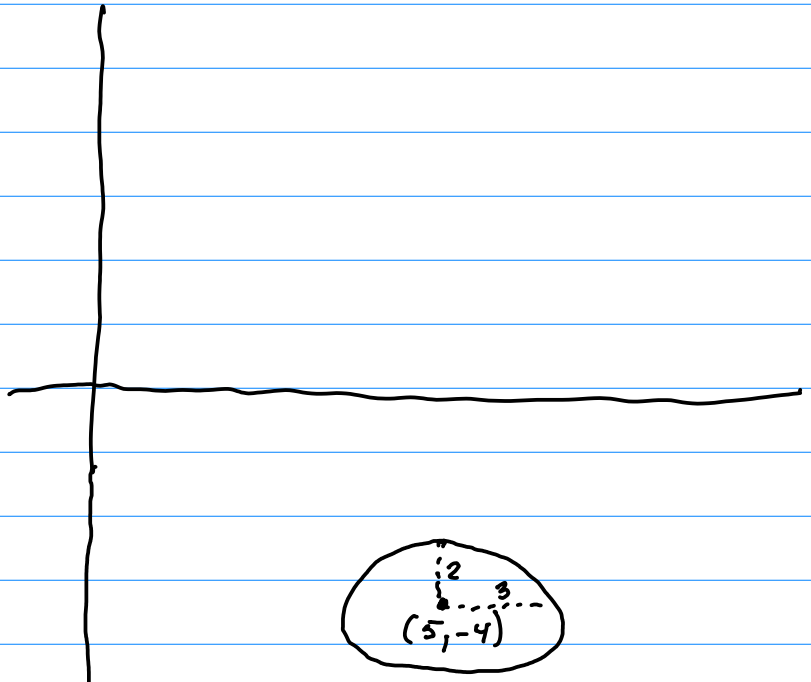


Ellipses



$$\frac{(x-h)^2}{a^2} + \frac{(y-K)^2}{b^2} = 1$$

eg Find eq. of



$$\frac{(x-5)^2}{9} + \frac{(y+4)^2}{4} = 1$$

3^2 → 9

2^2 → 4