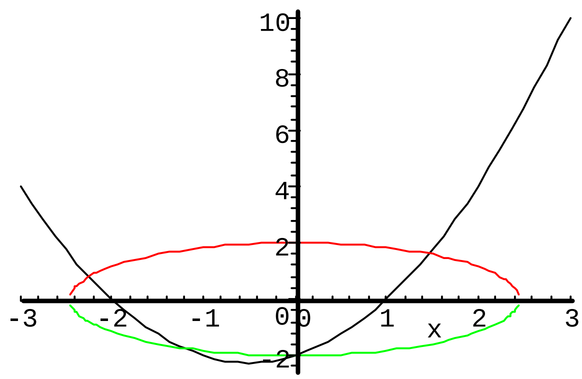
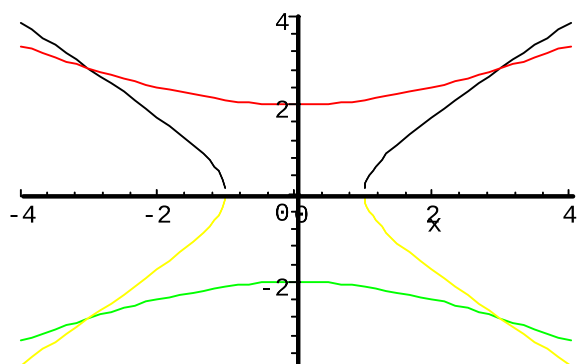
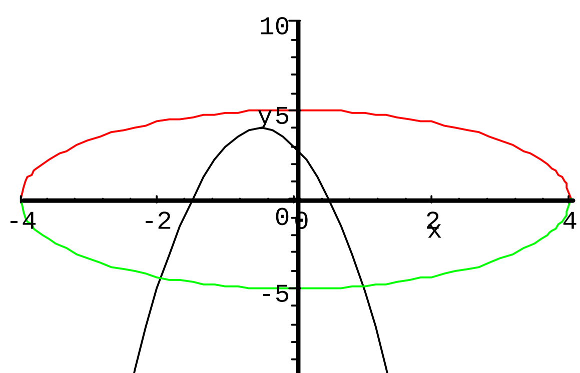
MATH DEPT.
SOLUTION TO TUTORIAL 13

Solution 13: **Conics.**

1.







2. (i) $9x^2 - 36x + 4y^2 = 0$

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

$9(x^2 - 4x + 4) + 4y^2 = 36$

$9(x-2)^2 + 4y^2 = 36$

$\frac{(x-2)^2}{4} + \frac{y^2}{9} = 1$ and ellipse with centre at (2,0)

(ii) $9x^2 - y^2 + 18x + 6y = 0$

$9x^2 + 18x - y^2 + 6y = 0$

$9(x^2 + 2x) - (y^2 - 6y) = 0$

$9(x^2 + 2x + 1) - (y^2 - 6y + 9) = 0$

$9(x+1)^2 - (y-3)^2 = 0$ or $(y-3)^2 = 9(x+1)^2$

$y - 3 = \pm 3(x+1)$ a pair of straight lines $y = -3x$; $y = 3x + 6$

(iii) $x^2 - 4y^2 - 2x + 16y = 31$

$x^2 - 2x - 4y^2 + 16y = 20$

$(x^2 - 2x + 1) - 4(y^2 - 4y + 4) = 31 + 1 - 16$

$(x-1)^2 - 4(y-2)^2 = 16$

$\frac{(x-1)^2}{16} - \frac{(y-2)^2}{4} = 1$ a hyperbola with centre at (1,2)

(iv) $4x^2 + 25y^2 - 24x + 250y + 561 = 0$

$4(x^2 - 6x) + 25(y^2 + 10y) = -561$

$4(x^2 - 6x + 9) + 25(y^2 + 10y + 25) = -561 + 36 + 625 = 100$

$4(x-3)^2 + 25(y+5)^2 = 100$

$\frac{(x-3)^2}{25} + \frac{(y+5)^2}{4} = 1$ an ellipse with centre at (3,–5)

(v) $16x^2 - 9y^2 - 96x + 288 = 0$

$16(x^2 - 6x) - 9y^2 = -288$

$16(x^2 - 6x + 9) - 9y^2 = -288 + 144 = -144$

$16(x-3)^2 - 9y^2 = -144$

$-\frac{(x-3)^2}{9} + \frac{y^2}{16} = 1$ a hyperbola with centre at (3,0)

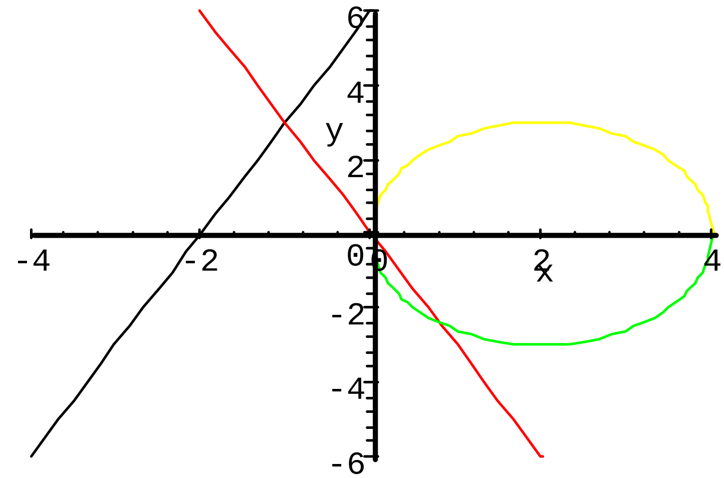
(vi) $3x^2 + 4y^2 + 30x - 40y + 175 = 0$

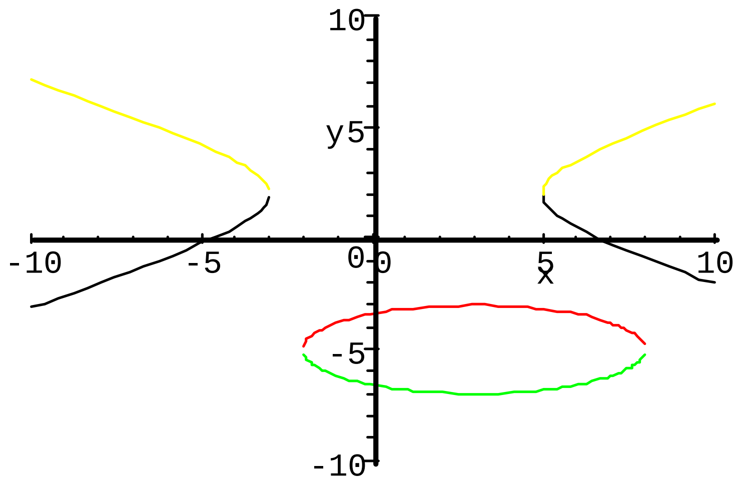
$3(x^2 + 10x) + 4(y^2 - 10y) = -175$

$3(x^2 + 10x + 25) + 4(y^2 - 10y + 25) = -175 + 75 + 100 = 0$

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

The only solution is $x = -5$ and $y = 5$ i.e. a point (–5,5) .


6
4
y
2
-4
-2
0
0
2
x
4
-2
-4
-6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y5
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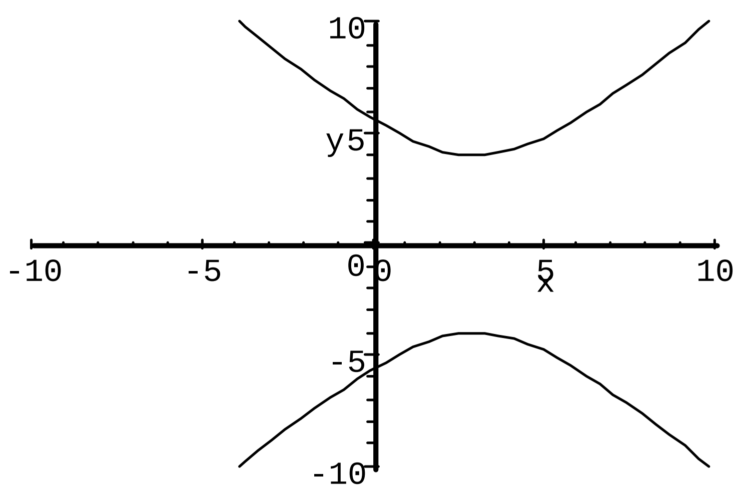
-5
0
0
5
x
10
-5
-10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y5
-10
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0
0
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x
10
-5
-10