

HONORS PRE-CALCULUS

Problem Set 10.2: #5-51 odd

⑤ $\frac{x^2}{4} + \frac{y^2}{9} = 1$ center: (0,0) a=3 b=2 B
 major axis is vertical

⑦ $\frac{x^2}{4} + \frac{y^2}{25} = 1$ center (0,0) a=5 b=2 D
 major axis is vertical

⑨ $\frac{(x-2)^2}{16} + (y+1)^2 = 1$ center: (2,-1) A

⑪ center: (0,0) a=4 b=2 $\frac{x^2}{4} + \frac{y^2}{16} = 1$

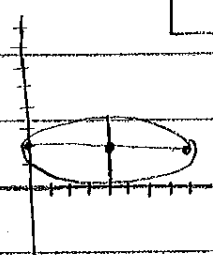
⑬ center: (0,0) a=7 c=2 $2^2 = 7^2 - b^2$ $\frac{x^2}{49} + \frac{y^2}{45} = 1$
 $4 = 49 - b^2 \quad -45 = -b^2 \quad b = \sqrt{45}$

⑮ c=5 $2a = 14 \quad a = 7 \quad 5^2 = 7^2 - b^2$ $\frac{x^2}{49} + \frac{y^2}{24} = 1$
 $25 = 49 - b^2 \quad -b^2 = -24 \quad b = \sqrt{24}$

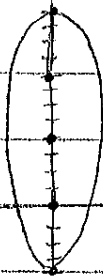
⑰ a=5 $\frac{x^2}{b^2} + \frac{y^2}{25} = 1$ $\frac{16}{b^2} + \frac{4}{25} = 1$ $\frac{16}{b^2} = \frac{21}{25}$ $400 = 21b^2$
 $\frac{400}{21} = b^2$

$\frac{x^2}{\frac{400}{21}} + \frac{y^2}{25} = 1$ $\frac{21x^2}{400} + \frac{y^2}{25} = 1$

⑲ center: (2,3) a=3 b=1 $\frac{(x-2)^2}{1} + \frac{(y-3)^2}{9} = 1$

⑳  center: (4,2) b=1 a=4 $\frac{(x-4)^2}{16} + \frac{(y-2)^2}{1} = 1$

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center: (0,4)

$$16 = 2a \quad a = 8$$

$$4^2 = 8^2 - b^2$$

$$16 = 64 - b^2$$

$$b^2 = 48$$

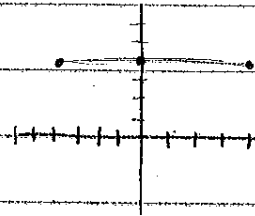
$$\frac{x^2}{48} + \frac{(y-4)^2}{64} = 1$$

25

center: (0,4)

$$a = 2c$$

vertices: (-4,4) (4,4)



$$2a = 8$$

$$a = 4$$

$$4 = 2c$$

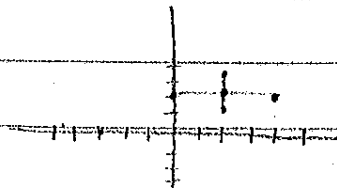
$$c = 2$$

$$2^2 = 4^2 - b^2$$

$$4 = 16 - b^2 \quad b^2 = 12$$

$$\frac{x^2}{16} + \frac{(y-4)^2}{12} = 1$$

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center: (2,2)

$$b = 1 \quad a = 2$$

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

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ellipse

center: (0,0)

vertices: (5,0) (-5,0)

foci: (3,0) (-3,0)

$$c^2 = 25 - 16 \Rightarrow c^2 = 9$$

$$e = \frac{c}{a}$$

$$e = \frac{3}{5}$$

31

$x^2 + y^2 = 25$ circle

center: (0,0)

radius: 5

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ellipse center: (0,0)

vertices: (0,3) (0,-3)

foci: (0,2) (0,-2)

$$a = 3 \quad b = \sqrt{5}$$

$$c^2 = 9 - 5$$

$$c^2 = 4 \quad c = 2$$

$$e = \frac{2}{3}$$

35

$$\frac{(x-4)^2}{16} + \frac{(y+1)^2}{25} = 1$$

ellipse

$$a = 5$$

center: (4,-1)

foci: (4,2) (4,-4)

$$b = 4$$

vertices: (4,4) (4,-6)

$$e = \frac{3}{5}$$

$$c^2 = 25 - 16 \quad c = 3$$

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

$$x^2 + (y+1)^2 = 4/9$$

center: (0,-1)

circle

radius: 2/3

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$(x+2)^2 + \frac{(y+4)^2}{1/4} = 1$ ellipse

$a=1 \quad b=1/2 \quad c=\frac{\sqrt{3}}{2}$

center: $(-2, -4)$

vertices: $(-3, -4)$
 $(-1, -4)$

foci: $(-2 + \frac{\sqrt{3}}{2}, -4)$

$(-2 - \frac{\sqrt{3}}{2}, -4)$



$e = \frac{\sqrt{3}}{2}$

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$9x^2 + 4y^2 + 36x - 24y + 36 = 0$

$(9x^2 + 36x) + (4y^2 - 24y) = -36$

$9(x^2 + 4x + 4) + 4(y^2 - 6y + 9) = -36 + 36 + 36$

$9(x+2)^2 + 4(y-3)^2 = 36$

$\frac{(x+2)^2}{4} + \frac{(y-3)^2}{9} = 1$ ellipse

center: $(-2, 3)$

vertices: $(-2, 6)$
 $(-2, 0)$

$e = \frac{\sqrt{5}}{3}$

$a=3 \quad b=2 \quad c=\sqrt{5}$

foci: $(-2, 3 + \sqrt{5})$ $(-2, 3 - \sqrt{5})$

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$x^2 + y^2 - 2x + 4y - 31 = 0$

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

$(x-1)^2 + (y+2)^2 = 36$ circle center: $(1, -2)$ radius: 6

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$3x^2 + y^2 + 18x - 2y - 8 = 0$

$(3x^2 + 18x) + (y^2 - 2y) = 8$

$3(x^2 + 6x + 9) + (y^2 - 2y + 1) = 8 + 27 + 1$

$a=6$
 $b=\sqrt{12}$

$\frac{3(x+3)^2}{36} + \frac{(y-1)^2}{36} = 1$ ellipse

center: $(-3, 1)$

vertices: $(-3, 7)$ $(-3, -5)$

$c^2 = 36 - 12 \quad c = \sqrt{24}$

$e = \frac{\sqrt{24}}{6}$

foci: $(-3, 1 + \sqrt{24})$

$(-3, 1 - \sqrt{24})$

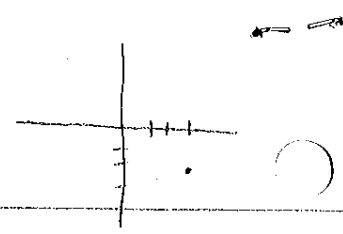
(47) $x^2 + 4y^2 - 6x + 20y - 2 = 0$
 $(x^2 - 6x + 9) + 4(y^2 + 5y + \frac{25}{4}) = 2 + 9 + 25$
 $(x-3)^2 + 4(y + \frac{5}{2})^2 = 36$
 $\frac{(x-3)^2}{36} + \frac{(y + \frac{5}{2})^2}{9} = 1$ ellipse

center: $(3, -\frac{5}{2})$

vertices: $(9, -\frac{5}{2})$ $(-3, -\frac{5}{2})$

foci: $(3 + \sqrt{27}, -\frac{5}{2})$ $(3 - \sqrt{27}, -\frac{5}{2})$

$e = \frac{\sqrt{27}}{6}$



$a=6$ $b=3$ $c=\sqrt{27}$

(49) $9x^2 + 9y^2 + 18x - 18y + 14 = 0$
 $9(x^2 + 2x + 1) + 9(y^2 - 2y + 1) = -14 + 9 + 9$
 $9(x+1)^2 + 9(y-1)^2 = 4$ $(x+1)^2 + (y-1)^2 = \frac{4}{9}$ circle

circle

center: $(-1, 1)$

radius: $\frac{2}{3}$

(51) $9x^2 + 25y^2 - 36x - 50y + 60 = 0$
 $(9x^2 - 36x) + (25y^2 - 50y) = -60$
 $9(x^2 - 4x + 4) + 25(y^2 - 2y + 1) = -60 + 36 + 25$
 $9(x-2)^2 + 25(y-1)^2 = 1$

$\frac{(x-2)^2}{1/9} + \frac{(y-1)^2}{1/25} = 1$ ellipse

$a=1/3$ $b=1/5$

$c = \frac{4}{15}$

center: $(2, 1)$

vertices: $(2 + 1/3, 1) \rightarrow (7/3, 1)$
 $(2 - 1/3, 1) \rightarrow (5/3, 1)$

foci: $(2 + 4/15, 1) \rightarrow (34/15, 1)$
 $(2 - 4/15, 1) \rightarrow (26/15, 1)$

$e = \frac{4/15}{1/3} = \frac{4}{5}$

