Conic Sections CS1: Midpoint and Distance

What is the midpoint of the line segment between the two points:

1. (1, 2) & (9, 10)

$\left(\frac{1+9}{2}, \frac{2+10}{2}\right) = \left(\frac{10}{2}, \frac{12}{2}\right) = (5, 6)$

2. (3, 1) & (−3, 7)

$\left(\frac{3+-3}{2}, \frac{1+7}{2}\right) = \left(\frac{0}{2}, \frac{8}{2}\right) = (0, 4)$

3. (2, 2) & (6, −4)

$\left(\frac{2+6}{2}, \frac{2-4}{2}\right) = \left(\frac{8}{2}, \frac{-2}{2}\right) = (4, -1)$

4. (1, 6) & (2, −1)

$\left(\frac{1+2}{2}, \frac{6+-1}{2}\right) = \left(\frac{3}{2}, \frac{5}{2}\right)$

Find the distance between the two points:

5. (1, 2) & (9, 10)

$d = \sqrt{(9-1)^2 + (10-2)^2}$

$= \sqrt{8^2 + 8^2} = \sqrt{64+64}$

$= \sqrt{128} = 8\sqrt{2}$

6. (3, 1) & (−3, 7)

$d = \sqrt{(-3-3)^2 + (7-1)^2}$

$= \sqrt{(-9)^2 + 6^2} = \sqrt{81+36}$

$= \sqrt{117} = 3\sqrt{13}$

7. (2, 2) & (6, −4)

$d = \sqrt{(6-2)^2 + (-4-2)^2}$

$= \sqrt{(4)^2 + (-6)^2} = \sqrt{16+36}$

$= \sqrt{52} = 2\sqrt{13}$

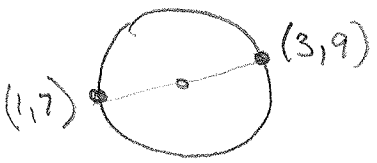
8. (1, 6) & (2, −1)

$d = \sqrt{(2-1)^2 + (-1-6)^2}$

$= \sqrt{1^2 + (-7)^2} = \sqrt{1+49}$

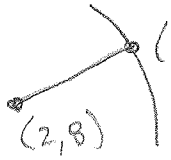
$= \sqrt{50} = 5\sqrt{2}$

9. A circle has a diameter with endpoints (3, 9) and (1, 7). What is the center and radius of the circle?



Center = midpoint $= \left(\frac{1+3}{2}, \frac{7+9}{2}\right) = \left(\frac{4}{2}, \frac{16}{2}\right) = (2, 8)$

radius = distance $= \sqrt{(3-2)^2 + (9-8)^2}$



$= \sqrt{1^2 + 1^2} = \sqrt{1+1} = \sqrt{2}$