SHOW ALL WORK

1. Find the distance between the points \((2, -3)\) and \((5, -9)\). Provide the exact answer in a simplified form.

\[
d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} = \sqrt{(5-2)^2 + (-9+3)^2} = \sqrt{3^2 + (-6)^2} = \sqrt{9 + 36} = \sqrt{45} = 3\sqrt{5} = 2\sqrt{5}
\]

2. Find the exact \(x\) and \(y\)-intercepts of the straight line \(\frac{1}{5}x + \frac{3}{4}y = 6\). Use the intercepts to graph the line.

\[
\begin{align*}
\text{X-int: set } y &= 0 \\
\frac{1}{5}x &= 6 \\
x &= 30 \\
(30, 0) \\
\text{Y-int: set } x &= 0 \\
\frac{3}{4}y &= 6 \\
y &= 8 \\
(0, 8)
\end{align*}
\]

3. Find the center and radius of the circle \((y - 2)^2 = -x^2 + 32\). Provide exact answers in a simplified form.

\[
\begin{align*}
(x^2 + (y-2)^2) &= 32 \\
(x-0)^2 + (y-2)^2 &= 32 \\
\therefore \text{Center } &= (0, 2) \\
\text{radius } r &= \sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}
\end{align*}
\]

4. Find the center and radius of the circle \(x^2 + 4x - 1 = y - y^2\). Provide exact answers.

Use completing the square:

\[
\begin{align*}
(x^2 + 4x + \frac{2^2}{4}) + (y^2 - y + \frac{1}{4}) &= 1 + \frac{21}{4} \\
(x + 2)^2 + (y - \frac{1}{2})^2 &= \frac{21}{4}
\end{align*}
\]

\[
\therefore \text{Center } &= (\frac{-2}{4}, \frac{1}{2}) \\
\text{radius } r &= \frac{\sqrt{21}}{4} = \frac{\sqrt{21}}{2}
\]

5. Find the equation of the line passing through the points \((-4, 2)\) and \((3, -7)\). Provide the answer in the standard form with integral coefficients.

\[
\begin{align*}
slope &= m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7 - 2}{3 + 1} = \frac{-9}{4} \\
7(y - 2) &= -9(x + 1) \\
7y - 14 &= -9x - 9 \\
9x + 7y &= -22
\end{align*}
\]
6. Find the equation of the line parallel to the line $5x - 3y - 1 = 0$, and which passes through the point $(-2, 1/3)$. Provide the exact answer in the slope-intercept form.

\[ 5x - 3y - 1 = 0 \]
\[ 3y = 5x - 1 \]
\[ y = \frac{5}{3}x - \frac{1}{3} \]

\[ \text{slope of given line} = \frac{5}{3} \]

\[ \text{eqn of line} \quad y - y_1 = m(x - x_1) \]
\[ y - \frac{1}{3} = \frac{5}{3}(x + 2) \]
\[ y = \frac{5}{3}x + \frac{10}{3} \]
\[ y = \frac{5}{3}x + \frac{11}{3} \]

7. A circle is having $(-1 + 2\sqrt{3}, \sqrt{5} + 2)$ and $(-1 - \sqrt{3}, 2\sqrt{5} + 2)$ as the ends points of a diameter. Find its radius. Provide the exact answer in a simplified form.

\[ \text{diameter} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(\sqrt{5} - \sqrt{5})^2 + (2\sqrt{5} + 2 - 2\sqrt{5} - 2)^2} \]
\[ = \sqrt{(-3\sqrt{5})^2 + (0)^2} = \sqrt{27 + 0} = \sqrt{27} = \sqrt{9 \times 3} = 3\sqrt{3} \]
\[ \text{radius} = \frac{\text{diameter}}{2} = \frac{3\sqrt{3}}{2} \]

8. A straight line cuts the $x$-axis at $-4$ and passes through the point $(7, -3)$. Find its equation in the standard form with integral coefficients.

\[ \text{Slope} = m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 0}{7 + 4} = \frac{-3}{11} \]

\[ \text{eqn:} \quad y - y_1 = m(x - x_1) \]
\[ y - 0 = \frac{-3}{11}(x + 4) \]
\[ y = \frac{-3}{11}(x + 4) \]
\[ 11y = -3x - 12 \]
\[ 3x + 11y = -12 \]

9. Solve the equation $\frac{7}{3}x^2 = -5x$ using any method. Provide exact answers.

\[ 7x^2 = -15x \]
\[ 7x^2 + 15x = 0 \]
\[ x(7x + 15) = 0 \]
\[ \therefore x = 0 \text{ or } 7x + 15 = 0 \]
\[ x = 0, -\frac{15}{7} \]

10. Use the method of completing the square to solve $2x^2 - 5 = 9x$. Provide exact answers. Use the other side.

\[ 2x^2 - 9x = 5 \]
\[ x^2 - \frac{9}{2}x = \frac{5}{2} \]
\[ (x - \frac{9}{4})^2 = \frac{5}{2} + \frac{81}{16} \]
\[ (x - \frac{9}{4})^2 = \frac{81 + 16}{16} \]
\[ x - \frac{9}{4} = \pm \frac{11}{4} \]
\[ x = \frac{9}{4} \pm \frac{11}{4} \]
\[ x = 5, -\frac{1}{2} \]