Math 105, Precalculus
Quiz 2, Sections 1.7, 1.8, 1.10
Name ANSWER KEY A
September 17, 2009

Please show all work neatly. Use of calculators is NOT permitted.

1. Solve the inequality: \( \frac{x}{x+1} > 1 \).

\[
\frac{x}{x+1} - 1 > 0
\]

\[
\frac{x}{x+1} - \frac{x-1}{x+1} = \frac{-1}{x+1} > 0
\]

Let \( x+1 = 0 \); \( x = -1 \)

Solution: \( \{ x \mid x < -1 \} \) or \( (-\infty, -1) \)

2. Use the points \( P(-1,1) \) and \( Q(2,7) \) to answer parts a-c below.
   a) Which of the points is closer to the point \( S(-2,5) \)?

   Use distance formula: \( d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} \).

   \[
d = \sqrt{(2-(-2))^2 + (7-5)^2} = \sqrt{4^2 + 2^2} = \sqrt{20}
\]

   Conclusion: point \( P \) is closer.

   b) Find the equation (in slope-intercept form) of the line through \( P \) and \( Q \).

   slope \( = \frac{7-1}{2 - (-1)} = \frac{6}{3} = 2 \).

   \[ \frac{y - 1}{x + 1} = \frac{2}{1} \]

   \[ y - 1 = 2(x + 1) = 2x + 2 \]

   \[ y = 2x + 3 \]

   (choose either point)

   c) Find the equation (in slope-intercept form) of the line perpendicular to the line in part b, and through the point \( (4, 4) \).

   \[ m_1 = -\frac{1}{2} \]

   \[ 4 = -\frac{1}{2}(4) + b \]

   \[ b = 6 \]

   \[ y = -\frac{1}{2}x + 6 \]

3. Determine whether the equation represents a circle, a point, or has no graph. If the equation is that of a circle, find its center and radius.

   \[ x^2 + y^2 - 14x + 45 = 0 \]

   \[ x^2 - 14x + y^2 = -45 \]

   \[ (x-7)^2 + y^2 = 4 \]

   Solution: \( b = -14 \)

   \[ b = -\frac{14}{2} = -7 \]

   \[ (\frac{b}{2})^2 = (-7)^2 = 49 \]

   Equation is a circle,
   with center \( (7, 0) \)
   radius = \( \sqrt{4} = 2 \)
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Please show all work neatly. Use of calculators is NOT permitted.

1. Solve the inequality: \( \frac{x}{x+3} > 1 \).

\[
\frac{x}{x+3} - 1 > 0
\]

\[
\frac{x}{x+3} - \frac{(x+3)}{(x+3)} = \frac{x-x-3}{x+3} = \frac{-3}{x+3} > 0
\]

\( x+3 = 0, x = -3 \)

\[ \text{Solution: } \{ x | x < -3 \} \text{ or } (-\infty, -3) \]

2. Use the points \( P(-1,1) \) and \( Q(1,5) \) to answer parts a-c below.

a) Which of the points is closer to the point \( S(-3,4) \)?

Use distance formula: \( d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} \)

\[
d_{P} = \sqrt{(-3+1)^2 + (4-1)^2} = \sqrt{4+9} = \sqrt{13}
\]

\[
d_{Q} = \sqrt{(-3-1)^2 + (4-5)^2} = \sqrt{16+1} = \sqrt{17}
\]

Point \( P \) is closer.

b) Find the equation (in slope-intercept form) of the line through \( P \) and \( Q \).

\[
m = \frac{5-1}{1+1} = \frac{4}{2} = 2
\]

\[
1 = 2(-1)+b, \quad b = 3
\]

\[
y = 2x+3
\]

(Choose either point)

\[
c) \text{ Find the equation (in slope-intercept form) of the line perpendicular to the line in part b, and through the point } (4,4).
\]

\[
m_1 = -\frac{1}{2}
\]

Solve for \( b \):

\[
4 = -\frac{1}{2}(4)+b, \quad b = 2
\]

\[
\therefore \quad y = -\frac{1}{2}x+6
\]

\[
o \quad y - 4 = -\frac{1}{2}(x-4) = -\frac{1}{2}x+2
\]

\[
y = -\frac{1}{2}x+6
\]

3. Determine whether the equation represents a circle, a point, or has no graph. If the equation is that of a circle, find its center and radius.

\[
x^2 + y^2 - 12y + 27 = 0
\]

\[
x^2 + y^2 - 12y = -27
\]

\[
x^2 + (y-6)^2 = 9
\]

Equation of a circle with center \((0,6)\)

radius: \( \sqrt{9} = 3 \).