Math 138 - exam 2 (Solutions)

October, 30 2010

Name: ________________________________ (Please print clearly.)

1. For each pair of lines, say whether they are parallel and don’t intersect, intersect at exactly one point, or overlap. If they intersect at exactly one point then give the coordinates.

\[
\begin{align*}
3x + 2y &= 1 \\
x - 2y &= 3
\end{align*}
\]

intersection at \((1, -1)\)

\[
\begin{align*}
x &= 5y + 1 \\
x - y &= 3
\end{align*}
\]

intersection at \((\frac{7}{2}, \frac{1}{2})\)

\[
\begin{align*}
y &= 2x + 4 \\
y &= 2x - 1
\end{align*}
\]

Parallel no intersection

\[
\begin{align*}
5x + 8y &= 20 \\
4y &= -5x
\end{align*}
\]

intersection at \((-4, 5)\)

\[
\begin{align*}
x &= \frac{y}{6} - \frac{5}{2} \\
x &= \frac{y}{6} - \frac{2}{5}
\end{align*}
\]

intersection at \((12, 30)\)
2 Solve the inequalities and graph the solution on a number line.

\[ 8x - 2 \geq 14 \quad 5x + 11 < 26 \]
\[ x \geq 2 \quad x < 3 \]
\[ x - 2 \geq 13x + 1 \quad 2x + 11 < 26 \]
\[ x \leq -1/4 \quad x < 15/2 \]
\[ x + 3 > 6 \quad \text{(AND)} \quad x + 3 < 8 \quad 2x - 5 \leq -11 \quad \text{(OR)} \quad 5x + 1 \geq 6 \]
\[ x > 3 \quad \text{AND} \quad x < 5 \quad x \leq -3 \quad \text{OR} \quad x \geq 1 \]
\[ 2x + 1 < 15 \quad \text{(OR)} \quad 3x - 4 \geq -1 \quad 2x - 5 \geq -1 \quad \text{(AND)} \quad 5x + 1 \leq -4 \]
\[ x < 7 \quad \text{OR} \quad x \geq 1 \quad \emptyset \]

3 Factor the polynomials and solve for \( x \) if it is a polynomial equation.

\[ 21x^2 + 28 \quad 3x(x + 1) + 2(x + 1) = 0 \]
\[ 7(3x^2 + 4) \quad x = -1, -2/3 \]
\[ 3x^2 + 12x + 2x + 8 \quad x^2 + 2x = -1 \]
\[ (3x + 2)(x + 4) \quad x = -1 \]
\[ 8x^3 - 40x^2 - 48x \quad 5x^2 = 14x - 8 \]
\[ 8x(x - 6)(x + 1) \quad x = 2, 4/5 \]
\[ 6x^4 + 13x^2 + 6 \quad 4x^2 = 12x - 9 \]
\[ (3x^2 + 2)(2x^2 + 3) \quad x = 3/2 \]
4 The length of a rectangular sign is 3ft longer than the width. The sign’s area is 54ft$^2$. Find the length and width.

\[
\text{Length} = 9, \quad \text{Width} = 6
\]

5 Some review problems:

1. Find the slope of the line containing the points $(-3, 1), (1, -3)$.

\[-1\]

2. Find the $x$-intercept and $y$-intercept (if they exist) and graph of the line $3x - 2y = 2$.

\[
x\text{-int} = \frac{2}{3}, \quad y\text{-int} = -1
\]

3. Find the inverse of the function $f(x) = \frac{1}{3}x - 2$.

\[
f^{-1}(x) = 3x + 6
\]

4. What is the domain of the function $f(x) = \frac{x+1}{x-2}$.

\[
\text{All reals except} \pm 2
\]

5. Let $f(x) = 2x + 1$ and let $g(x) = x^2 + 1$. Find $(f \circ g)(x)$.

\[
(f \circ g)(x) = 2x^2 + 3
\]