

King Fahd University of Petroleum and Minerals
Dammam Community College

MATH 011 – College Algebra I

Solutions to Class Test Two

Written Exam, Term 092

May 3, 2010

Write your name, ID number and section number.

Name: _____ ID # _____ Sec # _____

This exam consists of Eight questions.

Total _____/30.

Time allowed: One hour and fifteen minutes.

You must show all necessary steps of your solution.

Calculators are not allowed.

This test worth 7.5% of the total marks allocated to this course.

Question	Marks
1	/3
2	/4
3	/4
4	/3
5	/4
6	/3
7	/5
8	/4
Total marks =	/30

1. Find the value of k in the quadratic equation $4x^2 + 10x + 9 - k = 0$, such that the discriminant of the equation is equal to 100. [3 marks]

$$\text{Discriminant} = b^2 - 4ac = 100$$

$$100 - 4(4)(9 - k) = 100$$

$$-16(9 - k) = 0$$

$$\Rightarrow k = 9$$

2. Find the solution set of the equation:

[4 marks]

$$\frac{4x + 3}{x + 1} + \frac{2}{x} = \frac{1}{x^2 + x}$$

$$\frac{4x + 3}{x + 1} + \frac{2}{x} = \frac{1}{x(x + 1)} \quad \text{multiply by } x(x + 1); \quad x \neq 0, x \neq -1$$

$$x(4x + 3) + 2(x + 1) = 1$$

$$4x^2 + 3x + 2x + 2 - 1 = 0$$

$$4x^2 + 5x + 1 = 0 \Rightarrow (4x + 1)(x + 1) = 0$$

$$\Rightarrow x = -\frac{1}{4}, \quad \text{or} \quad x = -1$$

The solution $x = -1$ is not valid because of the restriction $x \neq -1$

$\therefore$ The solution set is $\left\{-\frac{1}{4}\right\}$

3. Find the solution set, in interval notation, of the following rational inequality: [4 marks]

$$\frac{x+2}{3+2x} \leq 5$$

$$\frac{x+2}{3+2x} - 5 \leq 0 \Rightarrow \frac{x+2-15-10x}{3+2x} \leq 0 \Rightarrow \frac{-9x-13}{3+2x} \leq 0$$

Critical values: Numerator $\Rightarrow -9x-13=0 \Rightarrow x=-\frac{13}{9}$
 Denominator $\Rightarrow 3+2x=0 \Rightarrow x=-\frac{3}{2}$

$-9x-13$	+	+	+	+	+	+	+	+	-	-	-	-
$3+2x$	-	-	-	-	+	+	+	+	+	+	+	+

Solution set: $(-\infty, -\frac{3}{2}) \cup [-\frac{13}{9}, \infty)$

4. Find the solution set of the following equation: [3 marks]

$$|5x-1| = |2x+3|$$

$$5x-1=2x+3 \Rightarrow 5x-2x=3+1$$

$$\Rightarrow 3x=4 \Rightarrow \boxed{x=\frac{4}{3}}$$

$$5x-1=-(2x+3) \Rightarrow 5x-1=-2x-3$$

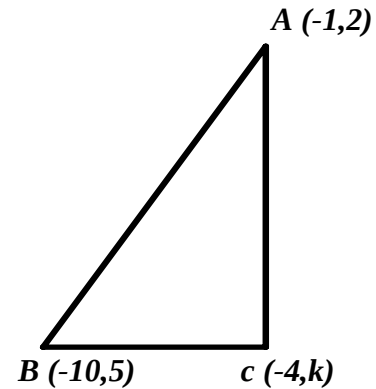
$$\Rightarrow 5x+2x=-3+1$$

$$\Rightarrow 7x=-2 \Rightarrow \boxed{x=\frac{-2}{7}}$$

$\therefore$ Solution set is $\left\{\frac{-2}{7}, \frac{4}{3}\right\}$

5. A right triangle with vertices $A(-1, 2)$, $B(-10, 5)$ and $C(-4, k)$. If segment AB is the hypotenuse, then find the possible values of k . [4 marks]

$$(\overline{AB})^2 = (\overline{AC})^2 + (\overline{BC})^2$$



$$\begin{aligned} \left(\sqrt{(-1 + 10)^2 + (2 - 5)^2} \right)^2 &= \left(\sqrt{(-1 + 4)^2 + (2 - k)^2} \right)^2 + \left(\sqrt{(-4 + 10)^2 + (k - 5)^2} \right)^2 \\ \Rightarrow (9)^2 + (-3)^2 &= (3)^2 + (2 - k)^2 + (6)^2 + (k - 5)^2 \\ \Rightarrow 81 + 9 &= 9 + 4 - 4k + k^2 + 36 + k^2 - 10k + 25 \\ \Rightarrow 2k^2 - 14k - 16 &= 0 \quad \text{Divide by 2} \\ \Rightarrow k^2 - 7k - 8 &= 0 \\ \Rightarrow (k - 8)(k + 1) &= 0 \\ \Rightarrow k = 8 \quad \text{or} \quad k &= -1 \end{aligned}$$

6. Find the value of k for which the slope of the line that passes through the points

$$\left(-4, \frac{k}{2}\right) \text{ and } \left(k, \frac{7}{2}\right) \text{ is equal to } \frac{-3}{2}$$

[3 marks]

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\frac{7}{2} - \frac{k}{2}}{k + 4} = \frac{-3}{2}$$

$$\Rightarrow \frac{\frac{7-k}{2}}{k+4} = -\frac{3}{2} \Rightarrow \frac{7-k}{2(k+4)} = -\frac{3}{2} \Rightarrow 7-k = -3k-12$$

$$\Rightarrow 3k - k = -12 - 7 \Rightarrow 2k = -19 \Rightarrow \boxed{k = -\frac{19}{2}}$$

7. If the radius of the circle $x^2 + y^2 + 2x + 4ky = 18$ is equal to $\sqrt{35}$.

a) Find the possible values of the constant k .

[4 marks]

$$x^2 + 2x + 1 + y^2 + 4ky + (2k)^2 = 18 + 1 + 4k^2$$

$$(x+1)^2 + (y+2k)^2 = 19 + 4k^2$$

$$\therefore (\text{radius})^2 = 19 + 4k^2 = 35$$

$$\Rightarrow 4k^2 = 16 \Rightarrow k^2 = 4 \Rightarrow k = \pm 2$$

$$\Rightarrow \text{The equation of the circle is } (x+1)^2 + (y \pm 4)^2 = 35$$

b) Given that the circle has its center in the 2nd quadrant, write the coordinates of the center.

[1 mark]

$$\boxed{\text{The center at } (-1, 4)}$$

8. Find all possible values of x so that the distance between $(x, -9)$ and $(3, -5)$ is 6.
[4 marks]

$$d = \sqrt{(x - 3)^2 + (-9 + 5)^2} = 6$$

$$\Rightarrow (x - 3)^2 + (-4)^2 = 36$$

$$\Rightarrow x^2 - 6x + 9 + 16 - 36 = 0 \quad \Rightarrow x^2 - 6x - 11 = 0$$

$$\Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{36 - 4(1)(-11)}}{2} = \frac{6 \pm \sqrt{36 + 44}}{2} = \frac{6 \pm \sqrt{80}}{2}$$

$$\Rightarrow x = \frac{6 \pm 4\sqrt{5}}{2} = 3 \pm 2\sqrt{5}$$

$$\Rightarrow \text{Solution set: } \{3 - 2\sqrt{5}, 3 + 2\sqrt{5}\}$$