

MATH 1314

Test 2 Review

19 Multiple Choice Questions

Example 1: The length of a rectangle is twice its width. If the perimeter of the rectangle is 180 feet, find the dimensions of the rectangle.

$$l = 2w$$

$$P = 2l + 2w$$

$$180 = 2(2w) + 2w$$

$$180 = 4w + 2w$$

$$\frac{180}{6} = \frac{6w}{6}$$

$$l = 2(30) = 60$$

$$30 = w$$

$$\boxed{60' \times 30'}$$

Example 2: Solve the following system of equations for y:

$$2 \times (4x + y = 47) \times 2 \rightarrow \begin{array}{r} 8x + \cancel{2y} = 94 \\ 6x - \cancel{2y} = -10 \\ \hline \end{array}$$

$$6x - 2y = -10$$

$$\begin{array}{r} 8x + \cancel{2y} = 94 \\ 6x - \cancel{2y} = -10 \\ \hline \end{array}$$

Special Cases:

$0 = 0 \rightarrow$ Infinitely
Many
Solutions

$2 = 0 \rightarrow$ No
Solutions

$$\begin{array}{r} \cancel{8}x = 84 \\ \hline \cancel{14} \quad \quad \quad 14 \\ \hline \end{array}$$

$$x = 6$$

$$4(6) + y = 47$$

$$\begin{array}{r} \cancel{24} + y = 47 \\ -\cancel{24} \quad \quad \quad -24 \\ \hline \end{array}$$

$$\boxed{y = 23}$$

Example 3: State all solutions to the equation:

$$x^2 + 40 = 0$$

$$\sqrt{x^2} = \sqrt{-40}$$

$$x = \pm i\sqrt{40}$$

$$x = \pm 2i\sqrt{10}$$

Example 4: Solve the following equation:

$$x^2 + 5x - 7 = 0$$

$$a = 1 \quad b = 5 \quad c = -7$$

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \leftarrow \text{Must Memorize}$$

$$X = \frac{-5 \pm \sqrt{5^2 - 4(1)(-7)}}{2(1)}$$

$$X = \frac{-5 \pm \sqrt{25 + 28}}{2} = \frac{-5 \pm \sqrt{53}}{2}$$

$$X = \frac{-5}{2} + \frac{\sqrt{53}}{2}, \quad \frac{-5}{2} - \frac{\sqrt{53}}{2}$$

Example 5: Solve the following by completing the square:

$$x^2 - 8x + 20 = 0$$

$$\underline{\quad -20 \quad -20 \quad}$$

$$x^2 - 8x = -20 \rightarrow x^2 - 8x + 16 = -20 + 16$$

$$b = -8$$

$$\frac{b}{2} = -4$$

$$\left(\frac{b}{2}\right)^2 = 16$$

$$\sqrt{(x-4)^2} = \sqrt{-4}$$

$$x + 4 = \pm 2i$$

$$\begin{array}{r} +4 \quad \quad \quad +4 \\ \hline \end{array}$$

$$x = 4 \pm 2i$$

*

Example 6: Solve:

$$\frac{3}{10x} - \frac{1}{6x} = 1$$

$$\text{LCD} = 30x$$

$$\frac{3}{10x} \cdot \frac{3}{3} - \frac{1}{6x} \cdot \frac{5}{5} = 1 \cdot \frac{30x}{30x}$$

$$\frac{9}{30x} - \frac{5}{30x} = \frac{30x}{30x}$$

$$9 - 5 = 30x$$

$$\frac{4}{30} = \frac{30x}{30}$$

$$\boxed{\frac{2}{15} = x}$$

Example 7: Simplify $\frac{3-2i}{2+i}$

$$\boxed{i^2 = -1}$$

$$\frac{(3-2i)}{(2+i)} \cdot \frac{(2-i)}{(2-i)} = \frac{6-3i-4i+2i^2}{4-2i+2i-i^2} = \frac{4-7i}{5}$$

$$\frac{4}{5} - \frac{7}{5}i$$

$a + bi$ form

Example 8: Simplify

A. $(5 - 4i)(-1 - 2i)$ FOIL

$$-5 - 10i + 4i + 8i^2 = \boxed{-13 - 6i}$$

$\underbrace{}_{\rightarrow -8}$

B. $(2 - 3i) - (-1 + 5i)$

$$2 - 3i + 1 - 5i$$

$$\boxed{3 - 8i}$$

Example 9: Solve the following inequality and express your answer in interval notation.

$$\begin{array}{r} -2 < 3 - 4x \leq 7 \\ \hline -3 \quad -3 \quad -3 \\ \hline -5 < -4x \leq 4 \\ \hline -4 \quad -4 \quad -4 \\ \hline \frac{5}{4} > x \geq -1 \\ \curvearrowright \\ -1 \leq x < \frac{5}{4} \\ [-1, \frac{5}{4}) \end{array}$$

Never: $-1 \geq x < \frac{5}{4}$

Popper 7:

Question # 1 – 5....Fill out answer choice A.

Example 10: Solve the following inequality and express your answer in interval notation.

$$\frac{|7x+8| - 4 < -3}{+4 \quad +4}$$

$$|7x+8| < 1$$

$$\begin{array}{r} -1 < 7x+8 < 1 \\ -8 \quad \quad -8 \quad -8 \end{array}$$

$$\begin{array}{r} -9 < 7x < -7 \\ \frac{1}{7} \quad \quad \frac{1}{7} \end{array}$$

$$-\frac{9}{7} < x < -1 \rightarrow \left(-\frac{9}{7}, -1\right)$$

special cases:

$$|\text{stuff}| \leq \text{Neg}$$

No Solution

$$|\text{stuff}| \geq \text{Neg}$$

$(-\infty, \infty)$

Example 11: Find the solution of the equation

$$2 + 3|4x - 1| \geq 14.$$

$$\begin{array}{r} \downarrow \quad \quad \quad \downarrow \\ 2 + 3|4x - 1| \geq 14. \\ \hline |4x - 1| \geq \frac{12}{3} \\ \hline |4x - 1| \geq 4 \end{array}$$

$$\begin{array}{r} 4x - 1 \leq -4 \quad \text{or} \\ \hline 4x \leq -3 \end{array}$$

$$\begin{array}{r} x \leq -\frac{3}{4} \end{array}$$

$$x \leq -\frac{3}{4} \quad \text{or}$$

$$\left(-\infty, -\frac{3}{4}\right] \cup$$

$$\begin{array}{r} 4x - 1 \geq 4 \\ \hline 4x \geq 5 \end{array}$$

$$\begin{array}{r} x \geq \frac{5}{4} \end{array}$$

$$x \geq \frac{5}{4}$$

$$\left[\frac{5}{4}, \infty\right)$$

Example 12: Find all solutions to the equation:

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~~$|3-2x|=6$~~

$$4|3-2x|-3=21$$

~~$+3$ $+3$~~

$$4|3-2x|=24$$

~~4 4~~

$$|3-2x|=6$$

$$\begin{array}{r} \cancel{3} - 2x = 6 \\ -3 \qquad -3 \end{array} \quad \text{or} \quad \begin{array}{r} \cancel{3} - 2x = -6 \\ -3 \qquad -3 \end{array}$$

$$\begin{array}{r} \cancel{-2}x = 3 \\ -2 \qquad -2 \end{array}$$
$$x = -\frac{3}{2}$$

$$\begin{array}{r} \cancel{-2}x = -9 \\ -2 \qquad -2 \end{array}$$
$$x = \frac{9}{2}$$

$$\left\{ -\frac{3}{2}, \frac{9}{2} \right\}$$

Example 13: Tom has a drawer with dimes, nickels and pennies in it. He has an equal number of each kind of coin. Tom counted his money and found that he has a total of \$2.40 in the drawer. How many nickels does Tom have?

$$\left. \begin{array}{l} d = x \\ n = x \\ p = x \end{array} \right\}$$

$$100^2 (.10d + .05n + .01p = 2.40) \times 100$$

$$10d + 5n + p = 240$$

$$10x + 5x + x = 240$$

$$16x = 240$$

$$x = 15$$

15 nickels

Example 14: Solve the following for x:

$$x^6 - 9x^3 - 36 = 0$$

$$u = x^3 \rightarrow u^2 = (x^3)^2 = x^6$$

$$u^2 - 9u - 36 = 0$$

$$(u - 12)(u + 3) = 0$$

$$u - 12 = 0 \quad u + 3 = 0$$

$$u = 12 \quad u = -3$$

$$u = 12$$

$$\sqrt[3]{x^3} = \sqrt[3]{12}$$

$$x = \sqrt[3]{12}$$

$$u = -3$$

$$\sqrt[3]{x^3} = \sqrt[3]{-3}$$

$$x = \sqrt[3]{-3}$$

Example 15: Solve the following for x: *

$$\sqrt{x+5} - x = 5$$

$$\begin{array}{r} \cancel{x} \quad \quad \quad \cancel{x} \\ \hline \end{array}$$

Check: $x = -4$

$$(\sqrt{x+5})^2 = (x+5)^2$$

$$x+5 = (x+5)(x+5)$$

$$x+5 = x^2 + 5x + 5x + 25$$

$$\begin{array}{r} \cancel{x} + 5 = x^2 + 10x + 25 \\ \hline \cancel{-x} - 5 \end{array}$$

$$0 = x^2 + 9x + 20$$

$$0 = (x+4)(x+5)$$

$$\begin{array}{|c|} \hline x = -4 \\ \hline x = -5 \\ \hline \end{array}$$

$$\{-4, -5\} \text{ } \textcircled{0} + 5 = 5 \checkmark$$

$$\sqrt{-4+5} - (-4) = 5$$

$$\sqrt{1} + 4 = 5$$

$$1 + 4 = 5 \checkmark$$

Check $x = -5$

$$\sqrt{-5+5} - (-5) = 5$$

$$\sqrt{0} + 5 = 5$$

Example 17: Solve the following for x: *

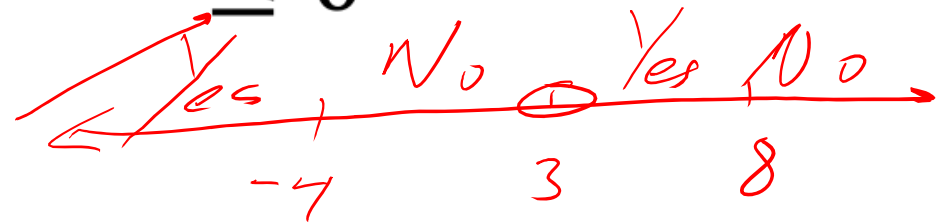
$$\frac{(x - 8)(x + 4)}{x - 3} \leq 0$$

$$(-\infty, -4] \cup (3, 8]$$

Nam:

$$\begin{aligned} x - 8 = 0 &\rightarrow x = 8 \\ x + 4 = 0 &\rightarrow x = -4 \end{aligned}$$

} square bracket



$$\text{Test } x = -5: \frac{(-5-8)(-5+4)}{(-5-3)} = \frac{N \cdot N}{N} = N$$

$$\text{Test } x = 0: \frac{(0-8)(0+4)}{(0-3)} = \frac{N \cdot P}{N} = P$$

Den:

$$x - 3 = 0 \rightarrow x = 3$$

} Round parenthesis

$$\text{Test } x = 5: \frac{(5-8)(5+4)}{(5-3)} = \frac{N \cdot P}{P} = N$$

$$\text{Test } x = 10: \frac{(10-8)(10+4)}{(10-3)} = \frac{P \cdot P}{P} = P$$

Example 18: Solve the following inequality:

$$2x^2 + 5x - 3 \leq x^2 - 2x - 15$$

$$-x^2 + 2x + 15 \quad -x^2 + 2x + 15$$

$$x^2 + 7x + 12 \leq 0$$

$$(x+3)(x+4) = 0$$

$$x+3=0$$

$$x = -3$$

$$x+4=0$$

$$x = -4$$

← No, Yes, No →
-4 -3

Test $x=0$

$$2(0)^2 + 5(0) - 3 \leq 0^2 - 2(0) - 15$$

$$-3 \leq -15$$

Not True

$$[-4, -3]$$

Popper 8:

Question # 1 – 5....Fill out answer choice C.