This is the Answer Key for Module 1 Version A

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1. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{11}{0}}$$

The solution is Not a Real Number

A. Irrational

B. Integer

C. Whole

D. Rational

E. Not a Real number

General Comments: The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number. Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

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2. Simplify the expression below and choose the interval the simplification is contained within.

$$19 - 20 \div 18 * 9 - (4 * 10)$$

The solution is -31.0

A. $[-27, -20]$

Messed up their order of operations.

B. $[55, 60]$

Did not distribute addition and subtraction correctly.

C. $[45, 54]$

Did not distribute negative correctly.

D. $[245, 251]$

This is just an arbitrary distractor.

E. $[-34, -29]$

* Correct option.

General Comments: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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3. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{\sqrt{60}}{17} + 8i^2$$

The solution is Irrational

A. Nonreal Complex

B. Not a Complex Number

C. Irrational

D. Rational

E. Pure Imaginary

General Comments: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number.

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4. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(6 - 10i)(-3 + 5i)$$

The solution is $32.0 + 60.0i$

A. $a \in [27, 36]$ and $b \in [53, 66]$

* Correct option.

B. $a \in [-72, -63]$ and $b \in [-4, 6]$

Corresponds to adding a minus sign in the first term.

C. $a \in [-72, -63]$ and $b \in [-4, 6]$

Corresponds to adding a minus sign in the second term.

D. $a \in [27, 36]$ and $b \in [-68, -58]$

Corresponds to adding a minus sign in both terms.

E. $a \in [-22, -10]$ and $b \in [-52, -48]$

Corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

General Comments: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

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5. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{54 - 11i}{-2 + 4i}$$

The solution is $-7.6 - 9.7i$

A. $a \in [-28, -21]$ and $b \in [-6, -2]$

Corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [-4, 2]$ and $b \in [9, 14]$

Forgot to multiply the conjugate by the numerator and didn't compute the conjugate correctly

C. $a \in [-13, -6]$ and $b \in [-13, -7]$

* Correct option.

D. $a \in [-13, -6]$ and $b \in [-197, -189]$

Forgot to multiply the conjugate by the numerator.

E. $a \in [-153, -151]$ and $b \in [-13, -7]$

Forgot to multiply the conjugate by the numerator and added a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

This is the Answer Key for Module 2 Version A

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6. First, find the equation of the line containing the two points below. Then, write the equation as $y = mx+b$ and choose the intervals that contain m and b.

$$(6, -4) \text{ and } (2, 5)$$

The solution is $y = -2.25x + 9.5$

A. $m \in [-5, -2]$ and $b \in [-9.96, -8.71]$

Corresponds to using the correct slope and getting the negative y-intercept.

B. $m \in [-5, 0]$ and $b \in [2.76, 4.17]$

Corresponds to using the correct slope/equation but not distributing correctly using the second point.

C. $m \in [-3, -1]$ and $b \in [9.04, 10.42]$

* Correct option.

D. $m \in [-2, 5]$ and $b \in [0.01, 0.56]$

Corresponds to using the negative slope and the correct equation.

E. $m \in [-3, 1]$ and $b \in [-10.34, -9.98]$

Corresponds to using the correct slope/equation but not distributing correctly using the first point.

General Comments: Remember to keep your points in order when plugging in to the slope formula.

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7. Write the equation of the line in the graph below in the form $Ax + By = C$. Then, choose the intervals that contain $A, B,$ and C.

Equation that was graphed: $-0.4x + 1$

The solution is $2x + 5y = 5$

A. $A \in [4.73, 5.32], \quad B \in [-3.69, -1.76], \text{ and } \quad C \in [-3.1, -1.3]$

Corresponds to using the opposite slope of the graph, but did everything else correctly.

B. $A \in [-2.38, -1.52], \quad B \in [-6.13, -4.39], \text{ and } \quad C \in [-8.3, -4.5]$

Corresponds to not making A positive (by multiplying the equation by -1).

C. $A \in [1.47, 2.38], \quad B \in [3.21, 6.14], \text{ and } \quad C \in [1.7, 5.4]$

* Correct option.

D. $A \in [2.28, 2.92], \quad B \in [-1.8, -0.93], \text{ and } \quad C \in [-3.1, -1.3]$

Corresponds to using the opposite slope of the graph and not removing rational values.

E. $A \in [0.04, 0.49], \quad B \in [0.47, 2.13], \text{ and } \quad C \in [-0.1, 3]$

Corresponds to not removing rational values.

General Comments: Standard form is supposed to have $A > 0$ and all fractions removed.

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8. Find the equation of the line described below. Write the linear equation as $y = mx + b$ and choose the intervals that contain m and b.

Perpendicular to $5x - 4y = 3$ and passing through the point $(5, -9)$.

The solution is $y = -0.8x - 5.0$

A. $m \in [-1, 2]$ and $b \in [-2, 2]$

Corresponds to using the correct slope and mis-distributing while simplifying to slope-intercept form.

B. $m \in [-3, 2]$ and $b \in [4, 7]$

Corresponds to using the correct slope and getting the negative y-intercept.

C. $m \in [-2, -1.1]$ and $b \in [-6, -2]$

Corresponds to using the reciprocal slope $(1/m)$.

D. $m \in [-1.2, -0.2]$ and $b \in [-6, -4]$

* Correct option.

E. $m \in [0.7, 1.7]$ and $b \in [-15, -12]$

Corresponds to using the negative slope.

General Comments: Parallel slope is the same and perpendicular slope is opposite reciprocal. Opposite reciprocal means flipping the fraction and changing the sign (positive to negative or negative to positive).

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9. Solve the equation below. Then, choose the interval that contains the solution.

$$-6(-2 - 9x) = -13(-8x + 3)$$

The solution is 1.02

A. $x \in [0.9, 1.18]$

* Correct option.

B. $x \in [0.29, 0.51]$

Corresponds to not distributing the negative in front of the first parentheses correctly.

C. $x \in [0.06, 0.27]$

Corresponds to getting the negative of the actual solution.

D. $x \in [-0.55, -0.48]$

Corresponds to not distributing the negative in front of the second parentheses correctly.

E. There are no Real solutions.

Corresponds to students thinking a fraction means there is no solution to the equation.

General Comments: The most common mistake on this question is to not distribute correctly.

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10. Solve the linear equation below. Then, choose the interval that contains the solution.

$$\frac{-3x - 5}{2} - \frac{-7x + 8}{4} = \frac{8x + 6}{3}$$

The solution is -2.69

A. $x \in [-1.24, -0.79]$

Corresponds to not distributing correctly for the second fraction.

B. $x \in [-8.09, -7.53]$

Corresponds to dividing only the first term for each fraction (rather than multiplying to remove the fractions).

C. $x \in [-3, -2.66]$

* Correct option.

D. $x \in [-1.91, -1.6]$

Corresponds to getting the negative of the actual solution.

E. There are no Real solutions.

Corresponds to students thinking a fraction means there is no solution to the equation.

General Comments: If you are having trouble with this problem, try to remove a fraction at a time by multiplying each term by the denominator.

This is the Answer Key for Module 3 Version A

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11. Using an interval or intervals, describe all the x-values within or including a distance of the given values.

No more than 7 units from the number 4.

The solution is $[-3, 11]$

A. $(3, 11)$

Corresponds to flipping the numbers AND not including the endpoints.

B. $[3, 11]$

Corresponds to flipping which number is the 'center' and how far away we are counting from the center number.

C. $(-3, 11)$

Corresponds to not including the endpoints.

D. $[-3, 11]$

* Correct option.

General Comments: No more than translates to within. So, we are looking for all the numbers within a certain number.

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12. Solve the linear inequality below. Then, choose the constant and interval combination that describes the solution set.

$$4 + 5x \leq 6x + 6$$

The solution is $[-2.0, \infty)$

A. $(-\infty, a]$, where $a \in [1.1, 4.7]$

Corresponds to inverting the inequality (wrong direction).

B. $[a, \infty)$, where $a \in [-2.4, -0.5]$

* Correct option.

C. $[a, \infty)$, where $a \in [1, 3]$

Corresponds to the negative of the actual solution.

D. $(-\infty, a]$, where $a \in [-5, 0]$

Corresponds to inverting the inequality AND the negative of the actual solution.

E. $(-\infty, \infty)$

Corresponds to the variable canceling, which does not happen in this instance.

General Comments: Remember that less than or equal to includes the endpoint!

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13. Solve the linear inequality below. Then, choose the constant and interval combination that describes the solution set.

$$\frac{7}{8} + \frac{3}{9}x > \frac{6}{4}x - \frac{8}{3}$$

The solution is $(-\infty, 3.036)$

A. (a, ∞), where $a \in [1, 6]$

Corresponds to inverting the inequality.

B. (a, ∞), where $a \in [-8, 0]$

Corresponds to inverting the inequality AND getting the negative of the solution.

C. $(-\infty, a)$, where $a \in [2, 4]$

* Correct option.

D. $(-\infty, a)$, where $a \in [-7, -2]$

Corresponds to getting the negative of the solution.

E. There is no solution to the inequality.

Corresponds to the variable canceling, which does not happen in this instance.

General Comments: Remember that less than or equal to includes the endpoint. Also, when multiplying or dividing by a negative, flip the sign.

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14. Solve the linear inequality below. Then, choose the constant and interval combination that describes the solution set.

$$-6 + 3x > 6x \text{ or } 9 - 3x < 6x$$

The solution is $(-\infty, -2.0)$ or $(1.0, \infty)$

A. $(-\infty, a) \cup (b, \infty)$, where $a \in [-2.7, -1.63]$ and $b \in [0.7, 1.9]$

* Correct option.

B. $(-\infty, a] \cup [b, \infty)$, where $a \in [-3.8, -1.8]$ and $b \in [0.84, 1.25]$

Corresponds to including the endpoints (when they should be excluded).

C. $(-\infty, a] \cup [b, \infty)$, where $a \in [-1.9, 0.3]$ and $b \in [1.29, 2.23]$

Corresponds to including the endpoints AND negating.

D. $(-\infty, a) \cup (b, \infty)$, where $a \in [-1.36, 1.11]$ and $b \in [1.4, 4.7]$

Corresponds to inverting the inequality and negating the solution.

E. $(-\infty, \infty)$

Corresponds to the variable canceling, which does not happen in this instance.

General Comments: When multiplying or dividing by a negative, flip the sign.

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15. Solve the linear inequality below. Then, choose the constant and interval combination that describes the solution set.

$$-5 + 8x < \frac{75x + 3}{9} \leq -4 + 5x$$

The solution is $(-16.0, -1.3]$

A. $(a, b]$, where $a \in [-2, 2]$ and $b \in [12, 17]$

Corresponds to negating and inverting the inequality.

B. $[a, b)$, where $a \in [0, 3]$ and $b \in [11, 17]$

Corresponds to including the endpoints AND inverting the inequality.

C. $(a, b]$, where $a \in [-19, -11]$ and $b \in [-9, 0]$

* This is the correct solution.

D. $[a, b)$, where $a \in [-19, -11]$ and $b \in [-3, 3]$

Corresponds to including the endpoints.

E. There is no solution to the inequality.

Corresponds to the variable canceling, which does not happen in this instance.

To solve, you will need to break up the compound inequality into two inequalities. Be sure to keep track of the inequality! It may be best to draw a number line and graph your solution.

This is the Answer Key for Module 4 Version A

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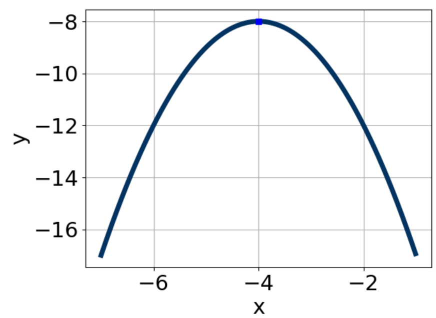
16. Write the equation of the graph presented below in the form $f(x) = ax^2 + bx + c$, assuming $a = 1$ or $a = -1$. Then, choose the intervals that $a, b,$ and c belong to.



The solution is $-x^2 - 8x - 24$

A. $a \in [0, 2], \quad b \in [6, 9], \text{ and } \quad c \in [-25, -20]$

Distractor 4: This distractor corresponds to having a and b as negative.

B. $a \in [-3, 0], \quad b \in [-10, -5], \text{ and } \quad c \in [-25, -20]$

* This is the correct solution

C. $a \in [-3, 0], \quad b \in [6, 9], \text{ and } \quad c \in [-11, -2]$

Distractor 3: This distractor corresponds to having b as negative AND not distributing correctly.

D. $a \in [-2, 0], \quad b \in [6, 9], \text{ and } \quad c \in [-25, -20]$

Distractor 1: This distractor corresponds to having b as negative.

E. $a \in [-3, 0], \quad b \in [-10, -5], \text{ and } \quad c \in [-11, -2]$

Distractor 2: This distractor corresponds to not distributing correctly (so that c is not correct).

General Comments: When the graph is pointing up, $a = 1$. When the graph is pointing down, $a = -1$. Be sure to use Vertex Form: $y = a(x - h)^2 + k$.

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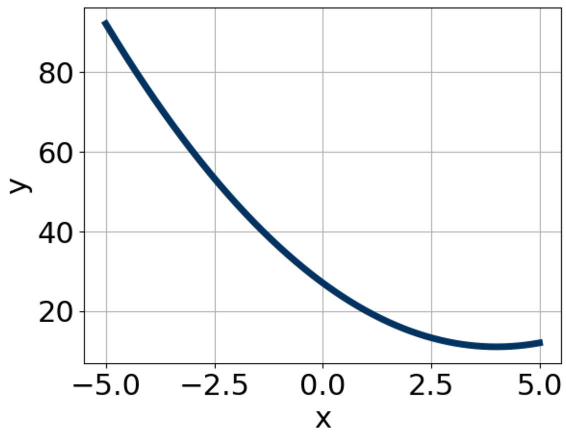
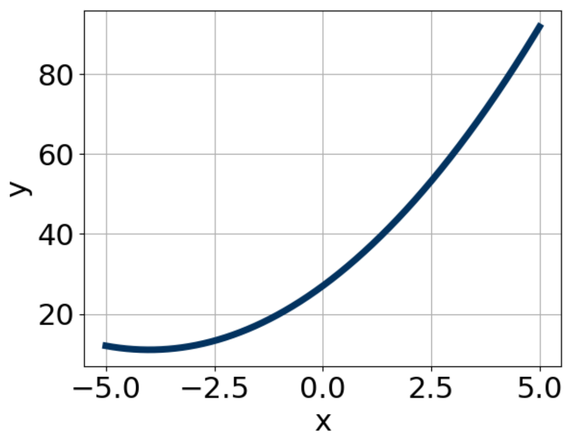
17. Graph the equation below.

$$f(x) = (x - 4)^2 + 11$$

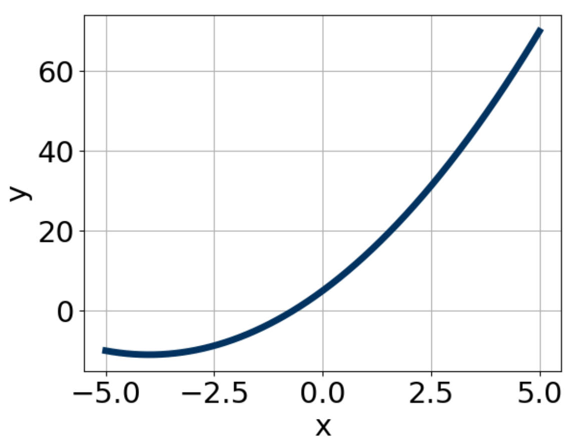
The solution is



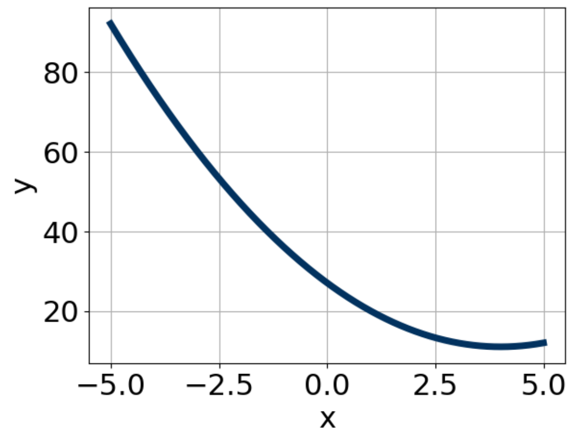
A. Distractor: Used the incorrect general form $f(x) = a(x + h)^2 + k$



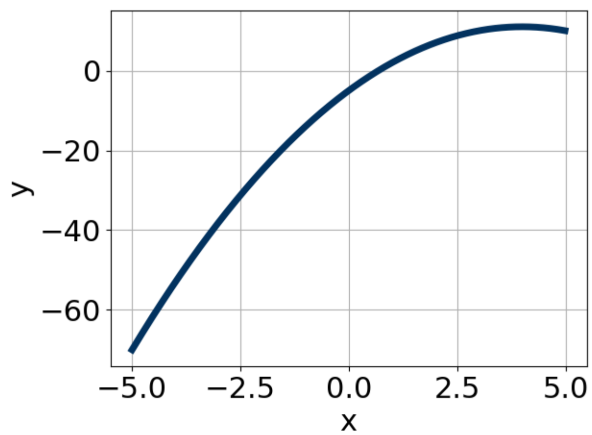
B. Distractor: Used the incorrect general form $f(x) = a(x + h)^2 - k$



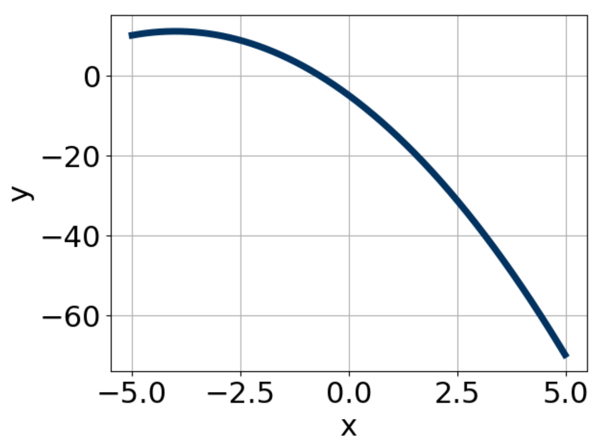
C. This is the correct option.



D. Distractor: Used the incorrect general form $f(x) = -a(x-h)^2 + k$



E. Distractor: Used the incorrect general form $f(x) = -a(x+h)^2 + k$



General Comments: Remember that Vertex Form is $y = a(x-h)^2 + k$, where the vertex is (h, k).

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18. Factor the quadratic below. Then, choose the intervals that contain the constants in the form $(ax + b)(cx + d); b \leq d$.

$$64x^2 - 48x + 9$$

The solution is $(8x-3)(8x-3)$

A. $a \in [14, 17.5], \quad b \in [-3.5, -2.5], \quad c \in [3, 5.5], \text{ and } \quad d \in [-3.5, -1.5]$

Corresponds to associating some factor of a to c.

B. $a \in [0.5, 1.5], \quad b \in [2, 3.5], \quad c \in [63.5, 64.5], \text{ and } \quad d \in [1.5, 4.5]$

Corresponds to choosing c=1.

C. $a \in [3.5, 6], \quad b \in [-3.5, -2.5], \quad c \in [15.5, 17], \text{ and } \quad d \in [-3.5, -1.5]$

Corresponds to associating some factor of c to a.

D. $a \in [0.5, 1.5], \quad b \in [-3.5, -2.5], \quad c \in [63.5, 64.5], \text{ and } \quad d \in [-3.5, -1.5]$

Corresponds to choosing a=1.

E. $a \in [7, 8.5], \quad b \in [-3.5, -2.5], \quad c \in [7.5, 8.5], \text{ and } \quad d \in [-3.5, -1.5]$

* Correct option.

General Comments: Remember that Vertex Form is $y = a(x-h)^2 + k$, where the vertex is (h, k).

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19. Solve the quadratic equation below. Then, choose the intervals that the solutions x_1 and x_2 belong to, with $z_1 \leq z_2$.

$$324x^2 + 0x - 9 = 0$$

The solution is $x_1 = -0.167$ and $x_2 = 0.167$

A. $x_1 \in [-0.04, 0]$ and $x_2 \in [2.94, 3.08]$

Distractor: Corresponds to the pair of solutions $x_1 = -0.009$ and $x_2 = 3.0$.

B. $x_1 \in [-3, -2.98]$ and $x_2 \in [-0.02, 0.03]$

Distractor: Corresponds to the pair of solutions $x_1 = -3.0$ and $x_2 = 0.009$.

C. $x_1 \in [-0.06, -0.03]$ and $x_2 \in [0.44, 0.54]$

Distractor: Corresponds to the pair of solutions $x_1 = -0.056$ and $x_2 = 0.5$.

D. $x_1 \in [-0.19, -0.06]$ and $x_2 \in [0.14, 0.23]$

* Correct option.

E. $x_1 \in [-0.54, -0.44]$ and $x_2 \in [0.03, 0.13]$

Distractor: Corresponds to the pair of solutions $x_1 = -0.5$ and $x_2 = 0.056$.

General Comments: This question can be factored, but it may be faster to find the solutions via the Quadratic Equation.

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20. Solve the quadratic equation below. Then, choose the intervals that the solutions belong to, with $x_1 \leq x_2$ (if they exist).

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

The solution is $x_1 = -1.232$ and $x_2 = 0.232$

A. $x_1 \in [-1.61, -1.17]$ and $x_2 \in [-0.16, 0.69]$

* Correct option.

B. $x_1 \in [-8.76, -8.57]$ and $x_2 \in [1.47, 1.96]$

Distractor: Corresponds to using $a = 1$ AND mis-writing the Quadratic Formula as b plus or minus...

C. $x_1 \in [-1.77, -1.59]$ and $x_2 \in [8.48, 9.13]$

Distractor: Corresponds to using $a = 1$.

D. $x_1 \in [-0.45, 0.51]$ and $x_2 \in [0.72, 1.24]$

Distractor: Corresponds to mis-writing the Quadratic Formula as b plus or minus...

E. There are no Real solutions.

Distractor: Corresponds to believing that if you cannot factor, there is no solution.

General Comments: This requires Quadratic Formula. Just be sure to use the correct formula and watch your signs.
