This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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1. Perform the division below. Then, find the intervals that correspond to the quotient in the form ax^2+bx+c and remainder r.

$$\frac{6x^3 - 44x^2 + 78x - 42}{x - 5}$$

The solution is $6x^2 - 14x + 8 + \frac{-2}{x-5}$

A. $a \in [29, 31], \; b \in [-200, -180], \; c \in [1046, 1053], \text{ and } r \in [-5284, -5281].$

You divided by the opposite of the factor AND multiplied the first factor rather than just bringing it down.

B. $a \in [1, 9], \; b \in [-22, -18], \; c \in [-6, -1], \text{ and } r \in [-52, -48].$

You multiplied by the synthetic number and subtracted rather than adding during synthetic division.

C. $a \in [29, 31], \; b \in [105, 114], \; c \in [605, 612], \text{ and } r \in [2996, 3000].$

You multiplied by the synthetic number rather than bringing the first factor down.

D. $a \in [1, 9], \; b \in [-15, -11], \; c \in [7, 10], \text{ and } r \in [-5, 1].$

* This is the solution!

E. $a \in [1, 9], \; b \in [-78, -69], \; c \in [446, 453], \text{ and } r \in [-2284, -2280].$

You divided by the opposite of the factor.

General Comment: General Comments: Be sure to synthetically divide by the zero of the denominator!

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2. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 9x^3 - 39x^2 - 38x + 40$$

The solution is $[-1.3333333333333333, 0.6666666666666666, 5]$

A. $z_1 \in [-5.71, -4.64], \; z_2 \in [-1.73, -1.3], \text{ and } z_3 \in [-0.12, 0.88]$

Distractor 3: Corresponds to negatives of all zeros AND inversing rational roots.

B. $z_1 \in [-5.71, -4.64], \; z_2 \in [-0.95, -0.49], \text{ and } z_3 \in [1.32, 1.78]$

Distractor 1: Corresponds to negatives of all zeros.

C. $z_1 \in [-0.77, -0.7], \; z_2 \in [1.35, 1.77], \text{ and } z_3 \in [4.58, 5.7]$

Distractor 2: Corresponds to inversing rational roots.

D. $z_1 \in [-1.84, -1.03], \; z_2 \in [0.29, 1.21], \text{ and } z_3 \in [4.58, 5.7]$

* This is the solution!

E. $z_1 \in [-5.71, -4.64]$, $z_2 \in [-0.25, -0.11]$, and $z_3 \in [3.93, 4.41]$

Distractor 4: Corresponds to moving factors from one rational to another.

General Comment: General Comments: Remember to try the middle-most integers first as these normally are the zeros. Also, once you get it to a quadratic, you can use your other factoring techniques to finish factoring.

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3. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 5x^2 + 7x + 7$$

The solution is $\pm 1, \pm 7$

A. All combinations of: $\dfrac{\pm 1, \pm 7}{\pm 1, \pm 5}$

This would have been the solution **if asked for the possible Rational roots**!

B. $\pm 1, \pm 7$

* This is the solution **since we asked for the possible Integer roots**!

C. All combinations of: $\dfrac{\pm 1, \pm 5}{\pm 1, \pm 7}$

Distractor 3: Corresponds to the plus or minus of the inverse quotient (an/a0) of the factors.

D. $\pm 1, \pm 5$

Distractor 1: Corresponds to the plus or minus factors of a1 only.

E. There is no formula or theorem that tells us all possible Integer roots.

Distractor 4: Corresponds to not recognizing Integers as a subset of Rationals.

General Comment: General Comments: We have a way to find the possible Rational roots. The possible Integer roots are the Integers in this list.

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4. Factor the polynomial below completely, knowing that $x - 4$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 20x^4 - 127x^3 + 134x^2 + 261x - 180$$

The solution is $[-1.25, 0.6, 3, 4]$

A. $z_1 \in [-4.12, -3.66]$, $z_2 \in [-3.42, -2.89], z_3 \in [-0.77, -0.16]$, and $z_4 \in [0.87, 2.6]$

Distractor 1: Corresponds to negatives of all zeros.

B. $z_1 \in [-1.79, -1.07]$, $z_2 \in [0.06, 1.02], z_3 \in [2.86, 3.08]$, and $z_4 \in [3.18, 4.97]$

* This is the solution!

C. $z_1 \in [-0.87, -0.59]$, $z_2 \in [1.61, 1.77], z_3 \in [2.86, 3.08]$, and $z_4 \in [3.18, 4.97]$

Distractor 2: Corresponds to inversing rational roots.

D. $z_1 \in [-4.12, -3.66]$, $z_2 \in [-3.42, -2.89], z_3 \in [-0.35, 0.12]$, and $z_4 \in [4.84, 5.17]$

Distractor 4: Corresponds to moving factors from one rational to another.

E. $z_1 \in [-4.12, -3.66]$, $z_2 \in [-3.42, -2.89], z_3 \in [-1.8, -1.43]$, and $z_4 \in [0.32, 1.06]$

Distractor 3: Corresponds to negatives of all zeros AND inversing rational roots.

General Comment: General Comments: Remember to try the middle-most integers first as these normally are the zeros. Also, once you get it to a quadratic, you can use your other factoring techniques to finish factoring.

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0. Perform the division below. Then, find the intervals that correspond to the quotient in the form ax^2+bx+c and remainder r.

$$\frac{8x^3 + 28x^2 - 32}{x+3}$$

The solution is $8x^2 + 4x - 12 + \dfrac{4}{x+3}$

A. $a \in [-28, -22], b \in [94, 105], c \in [-301, -299],$ and $r \in [860, 871]$.

You multipled by the synthetic number rather than bringing the first factor down.

B. $a \in [-28, -22], b \in [-50, -41], c \in [-138, -130],$ and $r \in [-431, -422]$.

You divided by the opposite of the factor AND multipled the first factor rather than just bringing it down.

C. $a \in [6, 10], b \in [0, 5], c \in [-17, -9],$ and $r \in [2, 14]$.

* This is the solution!

D. $a \in [6, 10], b \in [-9, 0], c \in [15, 18],$ and $r \in [-101, -93]$.

You multipled by the synthetic number and subtracted rather than adding during synthetic division.

E. $a \in [6, 10], b \in [50, 54], c \in [153, 159],$ and $r \in [432, 441]$.

You divided by the opposite of the factor.

General Comment: General Comments: Be sure to synthetically divide by the zero of the denominator! Also, make sure to include 0 placeholders for missing terms.
