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.

$$\frac{9x^3 - 28x - 13}{x - 2}$$

The solution is $9x^2 + 18x + 8 + \dfrac{3}{x-2}$

A. $a \in [14, 20], b \in [29, 40], c \in [36, 45],$ and $r \in [71, 77]$.

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

B. $a \in [2, 10], b \in [6, 13], c \in [-22, -14],$ and $r \in [-37, -30]$.

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

C. $a \in [14, 20], b \in [-42, -35], c \in [36, 45],$ and $r \in [-104, -95]$.

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

D. $a \in [2, 10], b \in [15, 20], c \in [6, 10],$ and $r \in [2, 5]$.

* This is the solution!

E. $a \in [2, 10], b \in [-22, -16], c \in [6, 10],$ and $r \in [-31, -23]$.

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.

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

$$\frac{6x^3 + 9x^2 - 51x + 34}{x + 4}$$

The solution is $6x^2 - 15x + 9 + \dfrac{-2}{x+4}$

A. $a \in [-2, 9],\ b \in [-24, -18],\ c \in [48, 56],$ and $r \in [-238, -229]$.

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

B. $a \in [-2, 9],\ b \in [-17, -13],\ c \in [3, 12],$ and $r \in [-5, 3]$.

* This is the solution!

C. $a \in [-30, -21],\ b \in [-90, -86],\ c \in [-402, -396],$ and $r \in [-1563, -1558]$.

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

D. $a \in [-2, 9], \; b \in [28, 36], \; c \in [76, 85],$ and $r \in [354, 359]$.

You divided by the opposite of the factor.

E. $a \in [-30, -21], \; b \in [104, 113], \; c \in [-472, -465],$ and $r \in [1913, 1924]$.

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

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

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

$$f(x) = 2x^3 + 3x^2 + 7x + 3$$

The solution is $\pm 1, \pm 3$

A. $\pm 1, \pm 3$

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

B. All combinations of: $\dfrac{\pm 1, \pm 3}{\pm 1, \pm 2}$

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

C. All combinations of: $\dfrac{\pm 1, \pm 2}{\pm 1, \pm 3}$

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

D. $\pm 1, \pm 2$

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 $x + 5$ 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.*

$$f(x) = 6x^4 + 55x^3 + 117x^2 - 88x - 240$$

The solution is $[-5, -4, -1.5, 1.3333333333333333]$

A. $z_1 \in [-5.54, -4.65], \; z_2 \in [-4.26, -3.9], z_3 \in [-2.14, -0.83],$ and $z_4 \in [1.27, 1.9]$

* This is the solution!

B. $z_1 \in [-1.37, -1.22], \; z_2 \in [1.32, 1.6], z_3 \in [3.23, 4.14],$ and $z_4 \in [4.12, 5.15]$

Distractor 1: Corresponds to negatives of all zeros.

C. $z_1 \in [-1.05, -0.46], \; z_2 \in [0.66, 0.73], z_3 \in [3.23, 4.14],$ and $z_4 \in [4.12, 5.15]$

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

D. $z_1 \in [-4.96, -3.52], \; z_2 \in [0.44, 0.51], z_3 \in [3.23, 4.14],$ and $z_4 \in [4.12, 5.15]$

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

E. $z_1 \in [-5.54, -4.65]$, $z_2 \in [-4.26, -3.9]$, $z_3 \in [-1.49, -0.16]$, and $z_4 \in [-0.12, 1.25]$

Distractor 2: Corresponds to 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. 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.*

$$f(x) = 4x^3 - 4x^2 - 33x + 45$$

The solution is $[-3, 1.5, 2.5]$

A. $z_1 \in [-2.7, -2.1]$, $z_2 \in [-2.08, -0.87]$, and $z_3 \in [2.7, 3.47]$

Distractor 1: Corresponds to negatives of all zeros.

B. $z_1 \in [-3.8, -2.9]$, $z_2 \in [0.15, 0.55]$, and $z_3 \in [0.49, 0.74]$

Distractor 2: Corresponds to inversing rational roots.

C. $z_1 \in [-1.8, 0.2]$, $z_2 \in [-0.49, -0.08]$, and $z_3 \in [2.7, 3.47]$

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

D. $z_1 \in [-3.8, -2.9]$, $z_2 \in [1.25, 1.89]$, and $z_3 \in [1.76, 2.8]$

* This is the solution!

E. $z_1 \in [-5.1, -4.8]$, $z_2 \in [-1.25, -0.55]$, and $z_3 \in [2.7, 3.47]$

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.
