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

$$\frac{8x^3 - 42x^2 + 67x - 28}{x - 2}$$

   A. $a \in [14, 17]$, $b \in [-16, -7]$, $c \in [45, 51]$, and $r \in [60, 69]$.

   B. $a \in [8, 9]$, $b \in [-61, -57]$, $c \in [183, 189]$, and $r \in [-398, -389]$.

   C. $a \in [8, 9]$, $b \in [-36, -31]$, $c \in [33, 34]$, and $r \in [5, 9]$.

   D. $a \in [14, 17]$, $b \in [-74, -71]$, $c \in [213, 218]$, and $r \in [-458, -455]$.

   E. $a \in [8, 9]$, $b \in [-27, -25]$, $c \in [14, 18]$, and $r \in [0, 4]$.

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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.*

$$f(x) = 4x^3 + 20x^2 - 9x - 45$$

   A. $z_1 \in [-5.01, -5]$, $z_2 \in [-1.39, -0.33]$, and $z_3 \in [-0.8, 1.3]$

   B. $z_1 \in [-5.01, -5]$, $z_2 \in [-2.11, -1.35]$, and $z_3 \in [1.1, 2.7]$

   C. $z_1 \in [-0.72, -0.66]$, $z_2 \in [0.44, 0.85]$, and $z_3 \in [4.4, 5.9]$

   D. $z_1 \in [-1.53, -1.44]$, $z_2 \in [0.69, 1.69]$, and $z_3 \in [4.4, 5.9]$

   E. $z_1 \in [-0.78, -0.72]$, $z_2 \in [2.59, 3.12]$, and $z_3 \in [4.4, 5.9]$

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3. 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.*

$$f(x) = 4x^4 - 67x^2 + 33x + 180$$

   A. $z_1 \in [-3.23, -2.53]$, $z_2 \in [-0.58, -0.22]$, $z_3 \in [0.6, 0.72]$, and $z_4 \in [3.4, 4.9]$

   B. $z_1 \in [-5.13, -4.59]$, $z_2 \in [-3.44, -2.59]$, $z_3 \in [0.7, 0.93]$, and $z_4 \in [3.4, 4.9]$

C. $z_1 \in [-3.23, -2.53]$, $z_2 \in [-2.86, -2.4]$, $z_3 \in [1.26, 1.66]$, and $z_4 \in [3.4, 4.9]$

D. $z_1 \in [-4.27, -3.21]$, $z_2 \in [-0.7, -0.64]$, $z_3 \in [0.27, 0.45]$, and $z_4 \in [1.7, 3.8]$

E. $z_1 \in [-4.27, -3.21]$, $z_2 \in [-1.93, -1.36]$, $z_3 \in [2.41, 2.88]$, and $z_4 \in [1.7, 3.8]$

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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.*

$$f(x) = 25x^4 - 10x^3 - 408x^2 + 160x + 128$$

A. $z_1 \in [-6, -3]$, $z_2 \in [-1.28, -1.25]$, $z_3 \in [2.4, 2.53]$, and $z_4 \in [1, 6]$

B. $z_1 \in [-6, -3]$, $z_2 \in [-0.82, -0.42]$, $z_3 \in [0.2, 0.42]$, and $z_4 \in [1, 6]$

C. $z_1 \in [-6, -3]$, $z_2 \in [-2.72, -2.19]$, $z_3 \in [1.02, 1.34]$, and $z_4 \in [1, 6]$

D. $z_1 \in [-6, -3]$, $z_2 \in [-4.12, -3.72]$, $z_3 \in [-0.23, 0.18]$, and $z_4 \in [1, 6]$

E. $z_1 \in [-6, -3]$, $z_2 \in [-0.62, -0.31]$, $z_3 \in [0.72, 0.97]$, and $z_4 \in [1, 6]$

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5. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 2x^4 + 4x^3 + 5x^2 + 6x + 5$$

A. $\pm 1, \pm 2$

B. All combinations of: $\dfrac{\pm 1, \pm 5}{\pm 1, \pm 2}$

C. $\pm 1, \pm 5$

D. All combinations of: $\dfrac{\pm 1, \pm 2}{\pm 1, \pm 5}$

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

6. 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.*

$$f(x) = 15x^3 + 44x^2 - 9x - 18$$

A. $z_1 \in [-0.14, 0.33]$, $z_2 \in [2.9, 3.23]$, and $z_3 \in [2.7, 3.3]$

B. $z_1 \in [-3.59, -2.56]$, $z_2 \in [-1.81, -1.37]$, and $z_3 \in [1.2, 1.9]$

C. $z_1 \in [-1, -0.26]$, $z_2 \in [0.27, 1.1]$, and $z_3 \in [2.7, 3.3]$

D. $z_1 \in [-3.59, -2.56]$, $z_2 \in [-1, -0.32]$, and $z_3 \in [-0.1, 1.4]$

E. $z_1 \in [-1.52, -1.01]$, $z_2 \in [1.24, 2.19]$, and $z_3 \in [2.7, 3.3]$

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

$$\frac{20x^3 - 85x^2 + 5x + 55}{x - 4}$$

A. $a \in [72, 84]$, $b \in [-406, -403]$, $c \in [1622, 1626]$, and $r \in [-6445, -6443]$.

B. $a \in [72, 84]$, $b \in [235, 241]$, $c \in [941, 951]$, and $r \in [3835, 3840]$.

C. $a \in [13, 25]$, $b \in [-5, 2]$, $c \in [-17, -10]$, and $r \in [-5, 1]$.

D. $a \in [13, 25]$, $b \in [-171, -164]$, $c \in [663, 670]$, and $r \in [-2609, -2603]$.

E. $a \in [13, 25]$, $b \in [-30, -24]$, $c \in [-74, -68]$, and $r \in [-160, -148]$.

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

$$f(x) = 5x^3 + 2x^2 + 4x + 4$$

A. $\pm 1, \pm 2, \pm 4$

B. $\pm 1, \pm 5$

C. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 5}$

D. All combinations of: $\dfrac{\pm 1, \pm 5}{\pm 1, \pm 2, \pm 4}$

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

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

$$\frac{8x^3 - 42x - 18}{x + 2}$$

A. $a \in [-16, -14], b \in [29, 33], c \in [-107, -103],$ and $r \in [194, 199]$.

B. $a \in [-16, -14], b \in [-36, -25], c \in [-107, -103],$ and $r \in [-231, -226]$.

C. $a \in [8, 10], b \in [-21, -8], c \in [-13, -7],$ and $r \in [-4, 7]$.

D. $a \in [8, 10], b \in [15, 17], c \in [-13, -7],$ and $r \in [-42, -32]$.

E. $a \in [8, 10], b \in [-25, -22], c \in [27, 32],$ and $r \in [-117, -105]$.

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

$$\frac{4x^3 - 28x + 26}{x + 3}$$

A. $a \in [-19, -11], b \in [-38.6, -34.1], c \in [-142, -128],$ and $r \in [-382, -378]$.

B. $a \in [4, 10], b \in [-16.8, -13.7], c \in [34, 42],$ and $r \in [-123, -112]$.

C. $a \in [4, 10], b \in [9.1, 13.3], c \in [7, 9],$ and $r \in [46, 51]$.

D. $a \in [4, 10], b \in [-13.5, -11.5], c \in [7, 9],$ and $r \in [2, 4]$.

E. $a \in [-19, -11], b \in [34.9, 36.3], c \in [-142, -128],$ and $r \in [434, 435]$.

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