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

$$\frac{20x^3 + 87x^2 - 80x - 72}{x + 5}$$

A. $a \in [19, 26]$, $b \in [185, 190]$, $c \in [847, 860]$, and $r \in [4200, 4206]$.

B. $a \in [19, 26]$, $b \in [-42, -29]$, $c \in [112, 121]$, and $r \in [-785, -778]$.

C. $a \in [-101, -95]$, $b \in [-414, -407]$, $c \in [-2147, -2143]$, and $r \in [-10799, -10794]$.

D. $a \in [-101, -95]$, $b \in [585, 592]$, $c \in [-3015, -3012]$, and $r \in [14999, 15004]$.

E. $a \in [19, 26]$, $b \in [-16, -11]$, $c \in [-16, -4]$, and $r \in [-2, 6]$.

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

$$f(x) = 4x^4 + 6x^3 + 7x^2 + 7x + 2$$

A. $\pm 1, \pm 2$

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

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

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

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

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3. Factor the polynomial below completely, knowing that $x + 3$ 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.*

$$f(x) = 20x^4 + 127x^3 + 46x^2 - 415x + 150$$

A. $z_1 \in [-3.5, -1.5]$, $z_2 \in [-1.11, -0.49]$, $z_3 \in [2.9, 3.27]$, and $z_4 \in [4.3, 6.2]$

B. $z_1 \in [-5, -3]$, $z_2 \in [-3.21, -2.66], z_3 \in [0.66, 0.81]$, and $z_4 \in [2.3, 2.6]$

C. $z_1 \in [-1.25, 2.75]$, $z_2 \in [-0.65, -0.3], z_3 \in [2.9, 3.27]$, and $z_4 \in [4.3, 6.2]$

D. $z_1 \in [-5, -3]$, $z_2 \in [-3.21, -2.66], z_3 \in [-0.12, 0.4]$, and $z_4 \in [-0.3, 1.8]$

E. $z_1 \in [-5, -3]$, $z_2 \in [-0.2, 0.37], z_3 \in [2.9, 3.27]$, and $z_4 \in [4.3, 6.2]$

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

$$\frac{20x^3 - 76x^2 - 32x + 59}{x - 4}$$

A. $a \in [18, 25]$, $b \in [-158, -152]$, $c \in [589, 597]$, and $r \in [-2311, -2305]$.

B. $a \in [76, 85]$, $b \in [-399, -395]$, $c \in [1550, 1562]$, and $r \in [-6154, -6144]$.

C. $a \in [76, 85]$, $b \in [242, 248]$, $c \in [943, 945]$, and $r \in [3830, 3837]$.

D. $a \in [18, 25]$, $b \in [-21, -11]$, $c \in [-82, -77]$, and $r \in [-181, -175]$.

E. $a \in [18, 25]$, $b \in [2, 6]$, $c \in [-19, -12]$, and $r \in [-7, -1]$.

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

$$\frac{15x^3 - 35x^2 + 24}{x - 2}$$

A. $a \in [28, 31], b \in [23, 32], c \in [47, 54]$, and $r \in [116, 130]$.

B. $a \in [15, 19], b \in [-22, -14], c \in [-23, -16]$, and $r \in [0, 7]$.

C. $a \in [15, 19], b \in [-7, -1], c \in [-17, -8]$, and $r \in [0, 7]$.

D. $a \in [15, 19], b \in [-65, -59], c \in [129, 134]$, and $r \in [-241, -231]$.

E. $a \in [28, 31], b \in [-104, -92], c \in [189, 194]$, and $r \in [-362, -355]$.

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

$$f(x) = 6x^3 + 2x^2 + 7x + 7$$

A. All combinations of: $\dfrac{\pm 1, \pm 7}{\pm 1, \pm 2, \pm 3, \pm 6}$

B. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 7}$

C. $\pm 1, \pm 7$

D. $\pm 1, \pm 2, \pm 3, \pm 6$

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

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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.

$$\frac{6x^3 - 42x + 38}{x + 3}$$

A. $a \in [1, 11], b \in [-18, -14], c \in [11, 20],$ and $r \in [2, 8]$.

B. $a \in [-21, -13], b \in [46, 58], c \in [-206, -203],$ and $r \in [644, 651]$.

C. $a \in [1, 11], b \in [15, 25], c \in [11, 20],$ and $r \in [70, 78]$.

D. $a \in [-21, -13], b \in [-59, -48], c \in [-206, -203],$ and $r \in [-576, -567]$.

E. $a \in [1, 11], b \in [-25, -23], c \in [54, 59],$ and $r \in [-181, -170]$.

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8. 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.*

$$f(x) = 6x^3 + 29x^2 - 20x - 75$$

A. $z_1 \in [-0.76, -0.43],\ z_2 \in [0.2, 1.1],$ and $z_3 \in [4, 8]$

B. $z_1 \in [-1.72, -1.37],\ z_2 \in [1, 1.8],$ and $z_3 \in [4, 8]$

C. $z_1 \in [-5.03, -4.73],\ z_2 \in [-1.4, 0.4],$ and $z_3 \in [0.6, 1.6]$

D. $z_1 \in [-5.03, -4.73]$, $z_2 \in [-3.4, -0.7]$, and $z_3 \in [0.67, 2.67]$

E. $z_1 \in [-1.13, -0.74]$, $z_2 \in [2.5, 3.6]$, and $z_3 \in [4, 8]$

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9. 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.*

$$f(x) = 4x^3 - 49x - 60$$

A. $z_1 \in [-2.5, -1.5]$, $z_2 \in [-1.97, -0.97]$, and $z_3 \in [3.2, 4.3]$

B. $z_1 \in [-6, -3]$, $z_2 \in [0.27, 0.52]$, and $z_3 \in [-0.1, 0.8]$

C. $z_1 \in [-0.67, 0.33]$, $z_2 \in [-0.59, -0.2]$, and $z_3 \in [3.2, 4.3]$

D. $z_1 \in [-6, -3]$, $z_2 \in [0.52, 0.99]$, and $z_3 \in [4.2, 6.5]$

E. $z_1 \in [-6, -3]$, $z_2 \in [1.43, 2.03]$, and $z_3 \in [2, 3.6]$

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10. Factor the polynomial below completely, knowing that $x - 3$ 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.*

$$f(x) = 6x^4 - 7x^3 - 118x^2 + 305x - 150$$

A. $z_1 \in [-4.1, -2.1]$, $z_2 \in [-1.61, -1.37]$, $z_3 \in [-0.54, -0.06]$, and $z_4 \in [4.9, 6.7]$

B. $z_1 \in [-5.9, -3.7]$, $z_2 \in [0.34, 0.44]$, $z_3 \in [1.16, 1.7]$, and $z_4 \in [2.1, 3.9]$

C. $z_1 \in [-4.1, -2.1]$, $z_2 \in [-2.02, -1.74]$, $z_3 \in [-0.91, -0.7]$, and $z_4 \in [4.9, 6.7]$

D. $z_1 \in [-4.1, -2.1]$, $z_2 \in [-2.63, -2.41]$, $z_3 \in [-0.68, -0.44]$, and $z_4 \in [4.9, 6.7]$

E. $z_1 \in [-5.9, -3.7]$, $z_2 \in [0.46, 0.72]$, $z_3 \in [2.32, 2.9]$, and $z_4 \in [2.1, 3.9]$
