1. 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.*

$$f(x) = 12x^3 - 29x^2 - 15x + 50$$

A. $z_1 \in [-1.61, -0.88]$, $z_2 \in [1.57, 1.67]$, and $z_3 \in [1.37, 2.08]$

B. $z_1 \in [-1.19, -0.67]$, $z_2 \in [0.5, 0.8]$, and $z_3 \in [1.37, 2.08]$

C. $z_1 \in [-2.28, -1.85]$, $z_2 \in [-1.78, -1.59]$, and $z_3 \in [1.21, 1.48]$

D. $z_1 \in [-2.28, -1.85]$, $z_2 \in [-0.44, -0.3]$, and $z_3 \in [4.54, 5.07]$

E. $z_1 \in [-2.28, -1.85]$, $z_2 \in [-0.61, -0.43]$, and $z_3 \in [0.26, 1.13]$

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2. 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.*

$$f(x) = 12x^4 + 13x^3 - 253x^2 - 512x - 240$$

A. $z_1 \in [-4.6, -3.2]$, $z_2 \in [-2.95, -0.11], z_3 \in [-2, 0.6]$, and $z_4 \in [4.06, 5.01]$

B. $z_1 \in [-4.6, -3.2]$, $z_2 \in [-2.95, -0.11], z_3 \in [-2, 0.6]$, and $z_4 \in [4.06, 5.01]$

C. $z_1 \in [-6, -4.3]$, $z_2 \in [0.36, 1.25], z_3 \in [1.1, 2.4]$, and $z_4 \in [3.9, 4.7]$

D. $z_1 \in [-6, -4.3]$, $z_2 \in [-0.27, 0.43], z_3 \in [2.4, 3.3]$, and $z_4 \in [3.9, 4.7]$

E. $z_1 \in [-6, -4.3]$, $z_2 \in [0.36, 1.25], z_3 \in [1.1, 2.4]$, and $z_4 \in [3.9, 4.7]$

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3. 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.*

$$f(x) = 8x^4 - 58x^3 + 79x^2 + 85x - 150$$

A. $z_1 \in [-1.2, -0.72]$, $z_2 \in [0.4, 1.1], z_3 \in [1.72, 2.14]$, and $z_4 \in [4.96, 5.07]$

B. $z_1 \in [-1.77, -1.12]$, $z_2 \in [1.1, 1.9], z_3 \in [1.72, 2.14]$, and $z_4 \in [4.96, 5.07]$

C. $z_1 \in [-5.99, -4.14]$, $z_2 \in [-4.1, -2.4], z_3 \in [-2.21, -1.94]$, and $z_4 \in [0.62, 0.74]$

D. $z_1 \in [-5.99, -4.14]$, $z_2 \in [-2.3, -0.6], z_3 \in [-1.78, -1.34]$, and $z_4 \in [1.19, 1.27]$

E. $z_1 \in [-5.99, -4.14]$, $z_2 \in [-2.3, -0.6], z_3 \in [-0.9, -0.57]$, and $z_4 \in [0.74, 0.8]$

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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.

$$\frac{15x^3 + 38x^2 - 37}{x + 2}$$

A. $a \in [12, 16], b \in [-9, -4], c \in [21, 25]$, and $r \in [-104, -97]$.

B. $a \in [-34, -24], b \in [98, 100], c \in [-197, -194]$, and $r \in [349, 357]$.

C. $a \in [12, 16], b \in [4, 12], c \in [-21, -9]$, and $r \in [-8, -1]$.

D. $a \in [12, 16], b \in [60, 70], c \in [133, 144]$, and $r \in [234, 237]$.

E. $a \in [-34, -24], b \in [-24, -20], c \in [-44, -42]$, and $r \in [-132, -121]$.

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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.

$$\frac{8x^3 - 14x^2 - 19x + 25}{x - 2}$$

A. $a \in [6, 10]$, $b \in [-8, -1]$, $c \in [-32, -17]$, and $r \in [-3, 6]$.

B. $a \in [6, 10]$, $b \in [-35, -27]$, $c \in [40, 43]$, and $r \in [-64, -52]$.

C. $a \in [16, 24]$, $b \in [-46, -38]$, $c \in [73, 74]$, and $r \in [-124, -115]$.

D. $a \in [6, 10]$, $b \in [-5, 6]$, $c \in [-19, -9]$, and $r \in [-5, -2]$.

E. $a \in [16, 24]$, $b \in [13, 19]$, $c \in [15, 21]$, and $r \in [57, 62]$.

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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.*

$$f(x) = 6x^3 - 29x^2 + 14x + 24$$

A. $z_1 \in [-5.5, -3.9]$, $z_2 \in [-1, -0.5]$, and $z_3 \in [1.27, 1.57]$

B. $z_1 \in [-1, -0.3]$, $z_2 \in [1.4, 1.9]$, and $z_3 \in [3.82, 4.15]$

C. $z_1 \in [-5.5, -3.9]$, $z_2 \in [-3.9, -2.7]$, and $z_3 \in [0.17, 0.38]$

D. $z_1 \in [-5.5, -3.9]$, $z_2 \in [-1.9, -0.7]$, and $z_3 \in [0.42, 0.76]$

E. $z_1 \in [-2.2, -1.2]$, $z_2 \in [0.3, 0.9]$, and $z_3 \in [3.82, 4.15]$

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

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

A. $\pm 1, \pm 5$

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

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

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

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

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

$$\frac{20x^3 + 65x^2 - 41}{x + 3}$$

A. $a \in [15, 24], b \in [-1, 9], c \in [-18, -12]$, and $r \in [2, 8]$.

B. $a \in [-63, -58], b \in [-119, -114], c \in [-347, -343]$, and $r \in [-1078, -1070]$.

C. $a \in [15, 24], b \in [-15, -10], c \in [60, 64],$ and $r \in [-282, -272]$.

D. $a \in [-63, -58], b \in [242, 247], c \in [-739, -729],$ and $r \in [2163, 2166]$.

E. $a \in [15, 24], b \in [124, 129], c \in [372, 376],$ and $r \in [1082, 1085]$.

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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.

$$\frac{20x^3 - 17x^2 - 40x - 15}{x - 2}$$

A. $a \in [17, 28], \ b \in [-58, -56], \ c \in [73, 84],$ and $r \in [-166, -161]$.

B. $a \in [17, 28], \ b \in [1, 4], \ c \in [-38, -33],$ and $r \in [-52, -50]$.

C. $a \in [17, 28], \ b \in [22, 24], \ c \in [6, 10],$ and $r \in [-3, -2]$.

D. $a \in [37, 44], \ b \in [-98, -90], \ c \in [151, 158],$ and $r \in [-325, -322]$.

E. $a \in [37, 44], \ b \in [60, 71], \ c \in [82, 89],$ and $r \in [153, 162]$.

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

$$f(x) = 5x^4 + 5x^3 + 7x^2 + 6x + 2$$

A. $\pm 1, \pm 5$

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

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

D. $\pm 1, \pm 2$

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