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.*

$$f(x) = 25x^3 + 75x^2 - 4x - 12$$

A. $z_1 \in [-2.84, -2.05]$, $z_2 \in [1.7, 3.9]$, and $z_3 \in [2.72, 3.06]$

B. $z_1 \in [-3.41, -2.56]$, $z_2 \in [-3.2, -1.3]$, and $z_3 \in [2.25, 2.51]$

C. $z_1 \in [-2.21, -1.96]$, $z_2 \in [-0.2, 0.2]$, and $z_3 \in [2.72, 3.06]$

D. $z_1 \in [-3.41, -2.56]$, $z_2 \in [-0.5, -0.1]$, and $z_3 \in [0.26, 0.46]$

E. $z_1 \in [-0.46, 0.08]$, $z_2 \in [0.3, 1.1]$, and $z_3 \in [2.72, 3.06]$

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2. Factor the polynomial below completely, knowing that $x + 2$ 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.*

$$f(x) = 25x^4 + 180x^3 + 388x^2 + 288x + 64$$

A. $z_1 \in [-0.04, 0.08]$, $z_2 \in [1.55, 2.66]$, $z_3 \in [3.95, 4.18]$, and $z_4 \in [3.5, 5.1]$

B. $z_1 \in [-4.54, -3.58]$, $z_2 \in [-2.78, -2.16]$, $z_3 \in [-2.04, -1.82]$, and $z_4 \in [-2.2, -0.5]$

C. $z_1 \in [1.11, 1.5]$, $z_2 \in [1.55, 2.66]$, $z_3 \in [2.39, 2.53]$, and $z_4 \in [3.5, 5.1]$

D. $z_1 \in [-4.54, -3.58]$, $z_2 \in [-2.13, -1.95]$, $z_3 \in [-0.92, -0.57]$, and $z_4 \in [-1.2, -0.1]$

E. $z_1 \in [0.38, 0.61]$, $z_2 \in [0.41, 1.1]$, $z_3 \in [1.55, 2.03]$, and $z_4 \in [3.5, 5.1]$

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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.*

$$f(x) = 15x^4 - 11x^3 - 257x^2 - 297x - 90$$

A. $z_1 \in [-6.9, -4.6]$, $z_2 \in [1.09, 1.71]$, $z_3 \in [1.66, 1.72]$, and $z_4 \in [2.21, 3.32]$

B. $z_1 \in [-4.8, -1.9]$, $z_2 \in [-1.79, -1.13]$, $z_3 \in [-1.52, -1.34]$, and $z_4 \in [4.95, 5.86]$

C. $z_1 \in [-6.9, -4.6]$, $z_2 \in [-0.33, 0.51]$, $z_3 \in [1.93, 2.22]$, and $z_4 \in [2.21, 3.32]$

D. $z_1 \in [-6.9, -4.6]$, $z_2 \in [0.58, 0.73]$, $z_3 \in [0.49, 0.9]$, and $z_4 \in [2.21, 3.32]$

E. $z_1 \in [-4.8, -1.9]$, $z_2 \in [-0.68, -0.15]$, $z_3 \in [-0.62, -0.59]$, and $z_4 \in [4.95, 5.86]$

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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.

$$\frac{4x^3 - 49x - 57}{x - 4}$$

A. $a \in [14, 18], b \in [60, 65], c \in [205, 208]$, and $r \in [768, 774]$.

B. $a \in [-3, 6], b \in [12, 15], c \in [-14, -8]$, and $r \in [-96, -95]$.

C. $a \in [-3, 6], b \in [-17, -14], c \in [12, 17]$, and $r \in [-119, -112]$.

D. $a \in [-3, 6], b \in [14, 24], c \in [12, 17]$, and $r \in [-2, 7]$.

E. $a \in [14, 18], b \in [-68, -58], c \in [205, 208]$, and $r \in [-885, -878]$.

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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.

$$\frac{20x^3 - 101x^2 - 7x + 65}{x - 5}$$

A. $a \in [17, 21]$, $b \in [-5, 1]$, $c \in [-13, -2]$, and $r \in [4, 6]$.

B. $a \in [100, 101]$, $b \in [395, 400]$, $c \in [1987, 1989]$, and $r \in [10005, 10013]$.

C. $a \in [17, 21]$, $b \in [-22, -15]$, $c \in [-92, -88]$, and $r \in [-303, -298]$.

D. $a \in [100, 101]$, $b \in [-606, -597]$, $c \in [2997, 3000]$, and $r \in [-14929, -14923]$.

E. $a \in [17, 21]$, $b \in [-204, -198]$, $c \in [997, 1006]$, and $r \in [-4928, -4921]$.

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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.*

$$f(x) = 12x^3 - 83x^2 + 125x - 50$$

A. $z_1 \in [-5.23, -4.58]$, $z_2 \in [-1.75, -1.37]$, and $z_3 \in [-1.33, -0.79]$

B. $z_1 \in [0.57, 0.77]$, $z_2 \in [1.1, 1.45]$, and $z_3 \in [4.52, 5.11]$

C. $z_1 \in [0.78, 0.9]$, $z_2 \in [1.4, 1.6]$, and $z_3 \in [4.52, 5.11]$

D. $z_1 \in [-5.23, -4.58]$, $z_2 \in [-2.04, -1.76]$, and $z_3 \in [-0.58, -0.18]$

E. $z_1 \in [-5.23, -4.58]$, $z_2 \in [-1.33, -1.13]$, and $z_3 \in [-0.67, -0.53]$

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

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

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

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

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

D. $\pm 1, \pm 7$

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

$$\frac{15x^3 - 45x + 28}{x + 2}$$

A. $a \in [15, 16], b \in [28, 32], c \in [14, 16]$, and $r \in [51, 60]$.

B. $a \in [15, 16], b \in [-36, -29], c \in [14, 16],$ and $r \in [-3, 1]$.

C. $a \in [-34, -23], b \in [58, 66], c \in [-166, -161],$ and $r \in [350, 360]$.

D. $a \in [15, 16], b \in [-45, -43], c \in [87, 97],$ and $r \in [-243, -239]$.

E. $a \in [-34, -23], b \in [-61, -58], c \in [-166, -161],$ and $r \in [-304, -300]$.

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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.

$$\frac{10x^3 + 16x^2 - 38x + 10}{x + 3}$$

A. $a \in [9, 11],\ b \in [45, 47],\ c \in [97, 101],$ and $r \in [305, 312]$.

B. $a \in [9, 11],\ b \in [-18, -12],\ c \in [3, 6],$ and $r \in [-7, 0]$.

C. $a \in [9, 11],\ b \in [-25, -20],\ c \in [53, 59],$ and $r \in [-225, -218]$.

D. $a \in [-33, -24],\ b \in [-77, -68],\ c \in [-264, -258],$ and $r \in [-773, -769]$.

E. $a \in [-33, -24],\ b \in [103, 107],\ c \in [-356, -350],$ and $r \in [1077, 1083]$.

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

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

A. $\pm 1, \pm 5$

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

C. $\pm 1, \pm 2$

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.
