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

$$\frac{16x^3 + 52x^2 - 130x + 47}{x + 5}$$

A. $a \in [12, 25],\ b \in [-32, -26],\ c \in [8, 15],$ and $r \in [-5, -2]$.

B. $a \in [12, 25],\ b \in [128, 133],\ c \in [530, 531],$ and $r \in [2697, 2702]$.

C. $a \in [-84, -79],\ b \in [-352, -340],\ c \in [-1875, -1866],$ and $r \in [-9309, -9300]$.

D. $a \in [-84, -79],\ b \in [451, 455],\ c \in [-2392, -2386],$ and $r \in [11988, 11999]$.

E. $a \in [12, 25],\ b \in [-46, -40],\ c \in [133, 135],$ and $r \in [-762, -755]$.

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

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

A. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 2, \pm 4}$

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

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

D. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 2, \pm 3, \pm 6}$

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

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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.*

$$f(x) = 12x^4 - 43x^3 - 111x^2 + 106x + 120$$

A. $z_1 \in [-2, 0],\ z_2 \in [-2.64, -1.1], z_3 \in [0.46, 0.96],$ and $z_4 \in [4, 6]$

B. $z_1 \in [-6, -4],\ z_2 \in [-2.64, -1.1], z_3 \in [0.46, 0.96],$ and $z_4 \in [0, 3]$

C. $z_1 \in [-2, 0]$, $z_2 \in [-1.33, 0.04], z_3 \in [1.19, 1.59]$, and $z_4 \in [4, 6]$

D. $z_1 \in [-6, -4]$, $z_2 \in [-1.33, 0.04], z_3 \in [1.19, 1.59]$, and $z_4 \in [0, 3]$

E. $z_1 \in [-6, -4]$, $z_2 \in [-4.24, -3.31], z_3 \in [-0.22, 0.52]$, and $z_4 \in [0, 3]$

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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.

$$\frac{8x^3 + 34x^2 - 39x - 42}{x + 5}$$

A. $a \in [4, 12]$, $b \in [-16, -12]$, $c \in [44, 51]$, and $r \in [-317, -309]$.

B. $a \in [4, 12]$, $b \in [69, 80]$, $c \in [330, 332]$, and $r \in [1613, 1619]$.

C. $a \in [-41, -37]$, $b \in [-166, -164]$, $c \in [-876, -862]$, and $r \in [-4388, -4381]$.

D. $a \in [-41, -37]$, $b \in [230, 235]$, $c \in [-1209, -1207]$, and $r \in [6002, 6005]$.

E. $a \in [4, 12]$, $b \in [-7, -2]$, $c \in [-11, -7]$, and $r \in [1, 8]$.

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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.

$$\frac{12x^3 + 52x^2 - 69}{x + 4}$$

A. $a \in [-50, -47], b \in [-140, -138], c \in [-560, -555]$, and $r \in [-2312, -2308]$.

B. $a \in [8, 15], b \in [-11, -7], c \in [40, 42]$, and $r \in [-275, -265]$.

C. $a \in [-50, -47], b \in [238, 246], c \in [-981, -973]$, and $r \in [3835, 3838]$.

D. $a \in [8, 15], b \in [99, 108], c \in [400, 403]$, and $r \in [1529, 1533]$.

E. $a \in [8, 15], b \in [4, 8], c \in [-16, -15]$, and $r \in [-5, 0]$.

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

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

A. $\pm 1, \pm 3$

B. All combinations of: $\dfrac{\pm 1, \pm 3}{\pm 1, \pm 2, \pm 4}$

C. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 3}$

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

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

$$\frac{4x^3 - 27x + 32}{x + 3}$$

A. $a \in [4, 6], b \in [-16, -13], c \in [34, 40],$ and $r \in [-116, -115]$.

B. $a \in [4, 6], b \in [-12, -7], c \in [6, 12],$ and $r \in [1, 10]$.

C. $a \in [-13, -10], b \in [36, 38], c \in [-139, -125],$ and $r \in [433, 443]$.

D. $a \in [4, 6], b \in [11, 17], c \in [6, 12],$ and $r \in [56, 61]$.

E. $a \in [-13, -10], b \in [-41, -35], c \in [-139, -125],$ and $r \in [-375, -371]$.

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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.*

$$f(x) = 12x^3 + 37x^2 - 59x - 60$$

A. $z_1 \in [-0.9, 0.4],\ z_2 \in [1.17, 1.85],$ and $z_3 \in [3.5, 5.1]$

B. $z_1 \in [-4.1, -3],\ z_2 \in [-1.14, -0.72],$ and $z_3 \in [0.9, 2.6]$

C. $z_1 \in [-4.1, -3],\ z_2 \in [-1.69, -0.93],$ and $z_3 \in [-0.6, 1.5]$

D. $z_1 \in [-5.2, -4.8],\ z_2 \in [-0.41, 0.52],$ and $z_3 \in [3.5, 5.1]$

E. $z_1 \in [-2.5, -1],\ z_2 \in [0.55, 0.98],$ and $z_3 \in [3.5, 5.1]$

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.*

$$f(x) = 8x^3 - 62x^2 + 145x - 100$$

A. $z_1 \in [-4.3, -3.9]$, $z_2 \in [-1.4, -0.6]$, and $z_3 \in [-0.48, 0.04]$

B. $z_1 \in [-0.7, 0.8]$, $z_2 \in [0.1, 0.9]$, and $z_3 \in [3.87, 4.22]$

C. $z_1 \in [-5.9, -4.2]$, $z_2 \in [-5.5, -3.6]$, and $z_3 \in [-0.75, -0.42]$

D. $z_1 \in [0.6, 1.4]$, $z_2 \in [1.8, 2.7]$, and $z_3 \in [3.87, 4.22]$

E. $z_1 \in [-4.3, -3.9]$, $z_2 \in [-2.8, -1.7]$, and $z_3 \in [-1.31, -1.11]$

10. 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.*

$$f(x) = 15x^4 + 46x^3 - 84x^2 - 120x - 32$$

A. $z_1 \in [-7, -3]$, $z_2 \in [-2.5, -2.17]$, $z_3 \in [-1.76, -0.91]$, and $z_4 \in [2, 3]$

B. $z_1 \in [-3, 0]$, $z_2 \in [0.18, 0.56]$, $z_3 \in [0.59, 1.05]$, and $z_4 \in [4, 5]$

C. $z_1 \in [-7, -3]$, $z_2 \in [-0.71, -0.23]$, $z_3 \in [-0.44, -0.2]$, and $z_4 \in [2, 3]$

D. $z_1 \in [-3, 0]$, $z_2 \in [1.35, 1.94]$, $z_3 \in [2.33, 2.69]$, and $z_4 \in [4, 5]$

E. $z_1 \in [-3, 0]$, $z_2 \in [-0.21, 0.26]$, $z_3 \in [1.42, 2.32]$, and $z_4 \in [4, 5]$