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

$$\frac{6x^3 + 12x^2 - 78x + 65}{x + 5}$$

A. $a \in [5, 8]$, $b \in [39, 48]$, $c \in [129, 136]$, and $r \in [725, 729]$.

B. $a \in [5, 8]$, $b \in [-18, -15]$, $c \in [8, 14]$, and $r \in [4, 8]$.

C. $a \in [-36, -29]$, $b \in [158, 163]$, $c \in [-890, -883]$, and $r \in [4503, 4507]$.

D. $a \in [5, 8]$, $b \in [-28, -19]$, $c \in [61, 70]$, and $r \in [-335, -324]$.

E. $a \in [-36, -29]$, $b \in [-140, -132]$, $c \in [-775, -767]$, and $r \in [-3775, -3773]$.

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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.*

$$f(x) = 6x^3 + 19x^2 - 65x - 50$$

A. $z_1 \in [-2.8, -1.1]$, $z_2 \in [0.01, 1.17]$, and $z_3 \in [5, 7]$

B. $z_1 \in [-5.7, -4.5]$, $z_2 \in [-0.94, -0.62]$, and $z_3 \in [2.5, 4.5]$

C. $z_1 \in [-5.7, -4.5]$, $z_2 \in [-1.56, -1.42]$, and $z_3 \in [0.4, 1.4]$

D. $z_1 \in [-0.5, 0.4]$, $z_2 \in [1.08, 1.78]$, and $z_3 \in [5, 7]$

E. $z_1 \in [-1.4, -0.6]$, $z_2 \in [1.6, 2.33]$, and $z_3 \in [5, 7]$

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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.*

$$f(x) = 8x^4 + 54x^3 + 15x^2 - 350x - 375$$

A. $z_1 \in [-3, -1.9]$, $z_2 \in [1.09, 1.55]$, $z_3 \in [2.85, 3.02]$, and $z_4 \in [4.3, 5.3]$

B. $z_1 \in [-5.9, -3.4]$, $z_2 \in [0.51, 0.66]$, $z_3 \in [2.85, 3.02]$, and $z_4 \in [4.3, 5.3]$

C. $z_1 \in [-5.9, -3.4]$, $z_2 \in [-3.17, -2.87]$, $z_3 \in [-1.05, -0.67]$, and $z_4 \in [-0.7, 0.5]$

D. $z_1 \in [-5.9, -3.4]$, $z_2 \in [-3.17, -2.87]$, $z_3 \in [-1.67, -1.07]$, and $z_4 \in [2.1, 4.2]$

E. $z_1 \in [-0.8, -0.3]$, $z_2 \in [0.77, 0.92]$, $z_3 \in [2.85, 3.02]$, and $z_4 \in [4.3, 5.3]$

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4. 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.*

$$f(x) = 6x^4 + 35x^3 - 9x^2 - 210x - 200$$

A. $z_1 \in [-2.91, -2.04]$, $z_2 \in [1.1, 1.43]$, $z_3 \in [1.76, 2.49]$, and $z_4 \in [4.7, 5.1]$

B. $z_1 \in [-5.06, -4.82]$, $z_2 \in [-2.04, -1.88]$, $z_3 \in [-1.2, -0.26]$, and $z_4 \in [0, 1.4]$

C. $z_1 \in [-0.93, -0.54]$, $z_2 \in [1.78, 2.01]$, $z_3 \in [3.71, 4.91]$, and $z_4 \in [4.7, 5.1]$

D. $z_1 \in [-0.41, 0]$, $z_2 \in [0.58, 1.14]$, $z_3 \in [1.76, 2.49]$, and $z_4 \in [4.7, 5.1]$

E. $z_1 \in [-5.06, -4.82]$, $z_2 \in [-2.04, -1.88]$, $z_3 \in [-1.43, -0.99]$, and $z_4 \in [2.2, 4.7]$

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

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

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

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

C. $\pm 1, \pm 7$

D. $\pm 1, \pm 3$

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

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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.*

$$f(x) = 4x^3 + 4x^2 - 23x - 30$$

A. $z_1 \in [-5.03, -4.83]$, $z_2 \in [0.73, 0.83]$, and $z_3 \in [1.36, 2.23]$

B. $z_1 \in [-2.6, -2.36]$, $z_2 \in [1.48, 1.51]$, and $z_3 \in [1.36, 2.23]$

C. $z_1 \in [-2.45, -1.97]$, $z_2 \in [-1.58, -1.45]$, and $z_3 \in [2.1, 2.57]$

D. $z_1 \in [-0.72, -0.31]$, $z_2 \in [0.66, 0.68]$, and $z_3 \in [1.36, 2.23]$

E. $z_1 \in [-2.45, -1.97]$, $z_2 \in [-0.77, -0.56]$, and $z_3 \in [0.32, 0.7]$

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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.

$$\frac{8x^3 + 44x^2 + 16x - 25}{x + 5}$$

A. $a \in [-48, -39]$, $b \in [238, 247]$, $c \in [-1209, -1200]$, and $r \in [5995, 6001]$.

B. $a \in [3, 13]$, $b \in [-8, 1]$, $c \in [32, 41]$, and $r \in [-267, -261]$.

C. $a \in [3, 13]$, $b \in [81, 85]$, $c \in [435, 440]$, and $r \in [2152, 2163]$.

D. $a \in [-48, -39]$, $b \in [-160, -153]$, $c \in [-767, -762]$, and $r \in [-3847, -3841]$.

E. $a \in [3, 13]$, $b \in [4, 8]$, $c \in [-7, 1]$, and $r \in [-7, -4]$.

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

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

A. All combinations of: $\dfrac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 7}$

B. All combinations of: $\dfrac{\pm 1, \pm 7}{\pm 1, \pm 2, \pm 4}$

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

D. $\pm 1, \pm 7$

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

$$\frac{12x^3 - 28x^2 + 14}{x - 2}$$

A. $a \in [8, 16], b \in [-7, -2], c \in [-9, -4],$ and $r \in [-7, 4]$.

B. $a \in [17, 30], b \in [-77, -73], c \in [152, 155],$ and $r \in [-296, -289]$.

C. $a \in [8, 16], b \in [-52, -50], c \in [102, 111],$ and $r \in [-197, -192]$.

D. $a \in [8, 16], b \in [-22, -11], c \in [-20, -15],$ and $r \in [-7, 4]$.

E. $a \in [17, 30], b \in [15, 23], c \in [38, 42],$ and $r \in [91, 99]$.

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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.

$$\frac{9x^3 + 21x^2 - 8}{x + 2}$$

A. $a \in [6, 11], b \in [36, 46], c \in [75, 79],$ and $r \in [143, 151]$.

B. $a \in [-24, -11], b \in [54, 63], c \in [-115, -110],$ and $r \in [218, 226]$.

C. $a \in [6, 11], b \in [1, 5], c \in [-9, -2],$ and $r \in [0, 6]$.

D. $a \in [-24, -11], b \in [-17, -13], c \in [-32, -28],$ and $r \in [-70, -66]$.

E. $a \in [6, 11], b \in [-6, 1], c \in [14, 24],$ and $r \in [-63, -61]$.
