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

$$\frac{16x^3 + 52x^2 - 31}{x + 3}$$

A. $a \in [-49, -46], b \in [-97, -87], c \in [-279, -272]$, and $r \in [-864, -858]$.

B. $a \in [15, 18], b \in [-13, -6], c \in [46, 51]$, and $r \in [-227, -220]$.

C. $a \in [15, 18], b \in [100, 105], c \in [290, 305]$, and $r \in [868, 873]$.

D. $a \in [-49, -46], b \in [194, 198], c \in [-590, -585]$, and $r \in [1732, 1740]$.

E. $a \in [15, 18], b \in [3, 8], c \in [-15, -11]$, and $r \in [2, 9]$.

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

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

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 Rational roots.

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

$$\frac{4x^3 - 27x + 29}{x + 3}$$

A. $a \in [-14, -8], b \in [-39, -26], c \in [-138, -132]$, and $r \in [-381, -372]$.

B. $a \in [-4, 11], b \in [10, 19], c \in [8, 12]$, and $r \in [49, 60]$.

C. $a \in [-4, 11], b \in [-12, -10], c \in [8, 12]$, and $r \in [-2, 9]$.

D. $a \in [-14, -8], b \in [36, 37], c \in [-138, -132],$ and $r \in [433, 436]$.

E. $a \in [-4, 11], b \in [-21, -15], c \in [35, 38],$ and $r \in [-124, -116]$.

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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.

$$\frac{15x^3 - 23x^2 - 128x - 82}{x - 4}$$

A. $a \in [57, 61],\ b \in [-266, -261],\ c \in [916, 931],$ and $r \in [-3778, -3774]$.

B. $a \in [15, 19],\ b \in [15, 23],\ c \in [-66, -57],$ and $r \in [-274, -263]$.

C. $a \in [57, 61],\ b \in [217, 223],\ c \in [740, 741],$ and $r \in [2872, 2882]$.

D. $a \in [15, 19],\ b \in [-90, -82],\ c \in [202, 209],$ and $r \in [-899, -891]$.

E. $a \in [15, 19],\ b \in [36, 40],\ c \in [16, 25],$ and $r \in [-3, 4]$.

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

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

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

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

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

D. $\pm 1, \pm 7$

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

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

$$\frac{8x^3 - 24x^2 - 90x + 55}{x - 5}$$

A. $a \in [2, 10]$, $b \in [2, 15]$, $c \in [-59, -57]$, and $r \in [-178, -174]$.

B. $a \in [2, 10]$, $b \in [-67, -55]$, $c \in [229, 231]$, and $r \in [-1098, -1092]$.

C. $a \in [36, 43]$, $b \in [-226, -221]$, $c \in [1029, 1036]$, and $r \in [-5107, -5090]$.

D. $a \in [36, 43]$, $b \in [174, 185]$, $c \in [787, 794]$, and $r \in [4002, 4009]$.

E. $a \in [2, 10]$, $b \in [13, 19]$, $c \in [-14, -2]$, and $r \in [5, 10]$.

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7. 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.*

$$f(x) = 16x^4 - 104x^3 + 89x^2 + 185x - 150$$

A. $z_1 \in [-6.2, -4.9]$, $z_2 \in [-2.26, -1.59]$, $z_3 \in [-0.76, -0.4]$, and $z_4 \in [0.92, 1.62]$

B. $z_1 \in [-6.2, -4.9]$, $z_2 \in [-4.02, -2.71]$, $z_3 \in [-2.19, -1.95]$, and $z_4 \in [0.16, 0.36]$

C. $z_1 \in [-1, 1.1]$, $z_2 \in [1.31, 2.09]$, $z_3 \in [1.94, 2.37]$, and $z_4 \in [4.78, 5.29]$

D. $z_1 \in [-2.4, -0.9]$, $z_2 \in [0.72, 0.77]$, $z_3 \in [1.94, 2.37]$, and $z_4 \in [4.78, 5.29]$

E. $z_1 \in [-6.2, -4.9]$, $z_2 \in [-2.26, -1.59]$, $z_3 \in [-1.66, -1.22]$, and $z_4 \in [0.75, 1.1]$

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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.*

$$f(x) = 10x^3 - 73x^2 + 127x - 60$$

A. $z_1 \in [0.67, 1.13]$, $z_2 \in [1.48, 1.57]$, and $z_3 \in [5, 5.04]$

B. $z_1 \in [-5.34, -4.96]$, $z_2 \in [-1.25, -1.09]$, and $z_3 \in [-0.68, -0.6]$

C. $z_1 \in [-5.34, -4.96]$, $z_2 \in [-1.65, -1.42]$, and $z_3 \in [-0.89, -0.68]$

D. $z_1 \in [-5.34, -4.96]$, $z_2 \in [-3.32, -2.65]$, and $z_3 \in [-0.55, -0.32]$

E. $z_1 \in [0.39, 0.75]$, $z_2 \in [1.23, 1.43]$, and $z_3 \in [5, 5.04]$

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9. 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.*

$$f(x) = 10x^4 - 121x^3 + 494x^2 - 755x + 300$$

A. $z_1 \in [0.11, 0.57]$, $z_2 \in [1.39, 2.41], z_3 \in [2.8, 4.2]$, and $z_4 \in [4.93, 5.22]$

B. $z_1 \in [0.59, 0.88]$, $z_2 \in [2.44, 2.88], z_3 \in [2.8, 4.2]$, and $z_4 \in [4.93, 5.22]$

C. $z_1 \in [-5.14, -4.94]$, $z_2 \in [-4.7, -3.64], z_3 \in [-3.8, -2.4]$, and $z_4 \in [-0.74, -0.46]$

D. $z_1 \in [-5.14, -4.94]$, $z_2 \in [-5.01, -4.34], z_3 \in [-5.9, -3.7]$, and $z_4 \in [-0.36, -0.19]$

E. $z_1 \in [-5.14, -4.94]$, $z_2 \in [-4.7, -3.64], z_3 \in [-2, -1.5]$, and $z_4 \in [-0.58, -0.34]$

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10. 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.*

$$f(x) = 6x^3 - 13x^2 - 13x + 30$$

A. $z_1 \in [-2.6, -1.8]$, $z_2 \in [-1.78, -1.42]$, and $z_3 \in [1.04, 1.81]$

B. $z_1 \in [-1, -0.5]$, $z_2 \in [0.53, 0.72]$, and $z_3 \in [1.81, 2.35]$

C. $z_1 \in [-1.7, -0.8]$, $z_2 \in [1.53, 1.85]$, and $z_3 \in [1.81, 2.35]$

D. $z_1 \in [-2.6, -1.8]$, $z_2 \in [-0.81, -0.28]$, and $z_3 \in [0.4, 0.81]$

E. $z_1 \in [-2.6, -1.8]$, $z_2 \in [-0.87, -0.65]$, and $z_3 \in [2.29, 3.55]$
