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

$$\frac{9x^3 - 72x^2 + 155x - 104}{x - 5}$$

   A. $a \in [40, 48],\ b \in [150, 154],\ c \in [918, 926],$ and $r \in [4488, 4500]$.

   B. $a \in [7, 12],\ b \in [-30, -19],\ c \in [17, 23],$ and $r \in [-6, -1]$.

   C. $a \in [7, 12],\ b \in [-117, -112],\ c \in [735, 743],$ and $r \in [-3804, -3797]$.

   D. $a \in [7, 12],\ b \in [-37, -33],\ c \in [8, 16],$ and $r \in [-64, -57]$.

   E. $a \in [40, 48],\ b \in [-299, -294],\ c \in [1635, 1650],$ and $r \in [-8308, -8300]$.

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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.*

$$f(x) = 9x^3 - 39x^2 - 38x + 40$$

   A. $z_1 \in [-5.47, -4.95],\ z_2 \in [-1.65, -0.97],$ and $z_3 \in [0.61, 1.1]$

   B. $z_1 \in [-1.17, -0.63],\ z_2 \in [1.41, 1.74],$ and $z_3 \in [4.72, 5.11]$

   C. $z_1 \in [-1.67, -0.77],\ z_2 \in [0.66, 1.21],$ and $z_3 \in [4.72, 5.11]$

   D. $z_1 \in [-5.47, -4.95],\ z_2 \in [-2.01, -1.92],$ and $z_3 \in [0.16, 0.7]$

   E. $z_1 \in [-5.47, -4.95],\ z_2 \in [-0.89, -0.18],$ and $z_3 \in [1.32, 1.46]$

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3. 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.*

$$f(x) = 25x^4 - 150x^3 + 191x^2 + 54x - 72$$

   A. $z_1 \in [-2.34, -0.86],\ z_2 \in [0.67, 4.67], z_3 \in [1.66, 2.34],$ and $z_4 \in [3.84, 4.71]$

   B. $z_1 \in [-4.09, -3.29],\ z_2 \in [-4, 0], z_3 \in [-1.03, -0.55],$ and $z_4 \in [0.3, 1.01]$

C. $z_1 \in [-4.09, -3.29]$, $z_2 \in [-4, 0]$, $z_3 \in [-0.23, -0.09]$, and $z_4 \in [2.81, 3.08]$

D. $z_1 \in [-0.88, -0.58]$, $z_2 \in [0.6, 1.6]$, $z_3 \in [1.66, 2.34]$, and $z_4 \in [3.84, 4.71]$

E. $z_1 \in [-4.09, -3.29]$, $z_2 \in [-4, 0]$, $z_3 \in [-1.68, -1.55]$, and $z_4 \in [1.61, 2.09]$

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4. 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.*

$$f(x) = 20x^4 + 63x^3 - 108x^2 - 172x - 48$$

A. $z_1 \in [-5.3, -3.9]$, $z_2 \in [-0.9, -0.58]$, $z_3 \in [-0.54, -0.22]$, and $z_4 \in [1.4, 2.8]$

B. $z_1 \in [-2.1, -1.8]$, $z_2 \in [1.27, 1.54]$, $z_3 \in [2.28, 2.52]$, and $z_4 \in [3.9, 4.6]$

C. $z_1 \in [-5.3, -3.9]$, $z_2 \in [-2.97, -2.47]$, $z_3 \in [-1.51, -1.26]$, and $z_4 \in [1.4, 2.8]$

D. $z_1 \in [-2.1, -1.8]$, $z_2 \in [-0.44, 0.14]$, $z_3 \in [2.54, 3.41]$, and $z_4 \in [3.9, 4.6]$

E. $z_1 \in [-2.1, -1.8]$, $z_2 \in [0.31, 0.94]$, $z_3 \in [0, 0.8]$, and $z_4 \in [3.9, 4.6]$

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

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

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

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

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

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

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

$$f(x) = 16x^3 + 32x^2 - 25x - 50$$

A. $z_1 \in [-2.09, -1.86]$, $z_2 \in [-1.06, -0.54]$, and $z_3 \in [0.67, 1.19]$

B. $z_1 \in [-2.09, -1.86]$, $z_2 \in [-1.28, -1.11]$, and $z_3 \in [1.23, 1.9]$

C. $z_1 \in [-1.27, -0.82]$, $z_2 \in [1.14, 1.32]$, and $z_3 \in [1.73, 3.34]$

D. $z_1 \in [-5.26, -4.5]$, $z_2 \in [0.09, 0.34]$, and $z_3 \in [1.73, 3.34]$

E. $z_1 \in [-0.87, 0.04]$, $z_2 \in [0.5, 0.94]$, and $z_3 \in [1.73, 3.34]$

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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.

$$\frac{8x^3 + 20x^2 - 56x - 27}{x + 4}$$

A. $a \in [5, 14]$, $b \in [43, 58]$, $c \in [152, 156]$, and $r \in [579, 585]$.

B. $a \in [-35, -28]$, $b \in [148, 153]$, $c \in [-652, -645]$, and $r \in [2558, 2573]$.

C. $a \in [5, 14]$, $b \in [-18, -7]$, $c \in [-12, 0]$, and $r \in [0, 7]$.

D. $a \in [5, 14]$, $b \in [-24, -18]$, $c \in [43, 45]$, and $r \in [-249, -246]$.

E. $a \in [-35, -28]$, $b \in [-109, -105]$, $c \in [-495, -485]$, and $r \in [-1984, -1978]$.

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

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

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

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

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

$$\frac{4x^3 + 12x^2 - 20}{x + 2}$$

A. $a \in [-10, -7], b \in [-5.6, -3.6], c \in [-15, -4],$ and $r \in [-36, -31]$.

B. $a \in [3, 13], b \in [-1.5, 0.5], c \in [-2, 3],$ and $r \in [-20, -16]$.

C. $a \in [3, 13], b \in [18.9, 21.4], c \in [39, 43],$ and $r \in [57, 61]$.

D. $a \in [-10, -7], b \in [27.9, 29.1], c \in [-60, -55],$ and $r \in [90, 97]$.

E. $a \in [3, 13], b \in [3.1, 4.1], c \in [-15, -4],$ and $r \in [-6, -1]$.

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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.

$$\frac{20x^3 + 63x^2 - 31}{x + 3}$$

A. $a \in [18, 23], b \in [2, 9], c \in [-9, -8],$ and $r \in [-5, -2]$.

B. $a \in [-61, -54], b \in [239, 251], c \in [-733, -721],$ and $r \in [2154, 2161]$.

C. $a \in [-61, -54], b \in [-118, -115], c \in [-351, -349],$ and $r \in [-1084, -1082]$.

D. $a \in [18, 23], b \in [122, 127], c \in [366, 371],$ and $r \in [1073, 1078]$.

E. $a \in [18, 23], b \in [-22, -16], c \in [68, 70],$ and $r \in [-306, -300]$.
