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

$$\frac{20x^3 - 42x^2 + 12}{x - 2}$$

A. $a \in [39, 47], b \in [-123, -118], c \in [242, 249],$ and $r \in [-477, -473]$.

B. $a \in [19, 26], b \in [-23, -19], c \in [-23, -20],$ and $r \in [-12, -7]$.

C. $a \in [39, 47], b \in [33, 40], c \in [75, 79],$ and $r \in [157, 165]$.

D. $a \in [19, 26], b \in [-87, -75], c \in [160, 170],$ and $r \in [-318, -311]$.

E. $a \in [19, 26], b \in [-9, 4], c \in [-11, -2],$ and $r \in [1, 7]$.

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2. 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.*

$$f(x) = 8x^4 - 34x^3 - 43x^2 + 159x + 180$$

A. $z_1 \in [-4.4, -3.21],\ z_2 \in [-3.17, -2.23], z_3 \in [0.03, 0.59],$ and $z_4 \in [4.45, 5.57]$

B. $z_1 \in [-4.4, -3.21],\ z_2 \in [-3.17, -2.23], z_3 \in [0.42, 1.09],$ and $z_4 \in [0.39, 1.06]$

C. $z_1 \in [-1.15, -0.69],\ z_2 \in [-0.72, 0.12], z_3 \in [2.92, 3.06],$ and $z_4 \in [3.29, 4.26]$

D. $z_1 \in [-2.15, -1.26],\ z_2 \in [-1.84, -0.97], z_3 \in [2.92, 3.06],$ and $z_4 \in [3.29, 4.26]$

E. $z_1 \in [-4.4, -3.21],\ z_2 \in [-3.17, -2.23], z_3 \in [0.94, 1.4],$ and $z_4 \in [0.91, 2.01]$

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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.

$$\frac{8x^3 + 16x^2 - 110x + 55}{x + 5}$$

A. $a \in [-43, -35],\ b \in [214, 222],\ c \in [-1193, -1188],$ and $r \in [6003, 6006]$.

B. $a \in [4, 9],\ b \in [-35, -30],\ c \in [79, 83],$ and $r \in [-440, -436]$.

C. $a \in [4, 9],\ b \in [-27, -16],\ c \in [7, 11],$ and $r \in [2, 6]$.

D. $a \in [-43, -35],\ b \in [-189, -183],\ c \in [-1035, -1027],$ and $r \in [-5096, -5092]$.

E. $a \in [4, 9],\ b \in [52, 60],\ c \in [166, 175],$ and $r \in [900, 908]$.

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

$$f(x) = 3x^4 + 6x^3 + 7x^2 + 2x + 2$$

A. $\pm 1, \pm 2$

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

C. $\pm 1, \pm 3$

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

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

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5. 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.*

$$f(x) = 12x^3 - 53x^2 + 57x - 18$$

A. $z_1 \in [-3.6, -1.8],\ z_2 \in [-1.77, -1.24],$ and $z_3 \in [-1.69, -1.02]$

B. $z_1 \in [1.2, 2.7],\ z_2 \in [1.14, 2.28],$ and $z_3 \in [2.54, 3.2]$

C. $z_1 \in [-3.6, -1.8],\ z_2 \in [-1.2, -0.08],$ and $z_3 \in [-0.85, -0.27]$

D. $z_1 \in [-3.6, -1.8],\ z_2 \in [-3.31, -2.54],\ \text{and}\ z_3 \in [-0.22, 0.29]$

E. $z_1 \in [0.5, 0.9],\ z_2 \in [0.42, 1.13],\ \text{and}\ z_3 \in [2.54, 3.2]$
