1. Factor the polynomial below completely, knowing that $x+3$ 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.*

$$f(x) = 20x^4 - 11x^3 - 269x^2 - 88x + 240$$

A. $z_1 \in [-5, -3.7]$, $z_2 \in [-1.13, -0.52]$, $z_3 \in [0.84, 1.84]$, and $z_4 \in [0.8, 3.8]$

B. $z_1 \in [-3.3, -2.1]$, $z_2 \in [-1.13, -0.52]$, $z_3 \in [0.84, 1.84]$, and $z_4 \in [3.8, 4.7]$

C. $z_1 \in [-3.3, -2.1]$, $z_2 \in [-2.29, -0.99]$, $z_3 \in [0.4, 1.19]$, and $z_4 \in [3.8, 4.7]$

D. $z_1 \in [-5, -3.7]$, $z_2 \in [-2.29, -0.99]$, $z_3 \in [0.4, 1.19]$, and $z_4 \in [0.8, 3.8]$

E. $z_1 \in [-5, -3.7]$, $z_2 \in [-0.68, 0.52]$, $z_3 \in [2.79, 4.39]$, and $z_4 \in [4.8, 5.5]$

---

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.*

$$f(x) = 10x^3 + 21x^2 - 91x - 60$$

A. $z_1 \in [-4.14, -3.89]$, $z_2 \in [-1.85, -1.26]$, and $z_3 \in [0, 1.1]$

B. $z_1 \in [-0.55, -0.44]$, $z_2 \in [2.7, 3.22]$, and $z_3 \in [3.3, 4.6]$

C. $z_1 \in [-4.14, -3.89]$, $z_2 \in [-0.78, -0.39]$, and $z_3 \in [1.6, 3.2]$

D. $z_1 \in [-0.42, -0.25]$, $z_2 \in [1.64, 1.96]$, and $z_3 \in [3.3, 4.6]$

E. $z_1 \in [-2.64, -2.46]$, $z_2 \in [0.58, 0.68]$, and $z_3 \in [3.3, 4.6]$

---

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

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

A. $\pm 1, \pm 7$

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

C. $\pm 1, \pm 2$

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

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

---

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

$$\frac{12x^3 + 28x^2 - 19}{x + 2}$$

A. $a \in [-27, -22], b \in [75, 83], c \in [-153, -149]$, and $r \in [283, 288]$.

B. $a \in [5, 15], b \in [48, 54], c \in [103, 106]$, and $r \in [188, 191]$.

C. $a \in [-27, -22], b \in [-21, -17], c \in [-43, -39]$, and $r \in [-101, -92]$.

D. $a \in [5, 15], b \in [-17, -6], c \in [21, 25]$, and $r \in [-92, -89]$.

E. $a \in [5, 15], b \in [-1, 12], c \in [-13, -5]$, and $r \in [-5, 7]$.

---

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

$$\frac{10x^3 + 33x^2 - 105x - 102}{x + 5}$$

A. $a \in [-51, -48]$, $b \in [279, 288]$, $c \in [-1521, -1518]$, and $r \in [7495, 7506]$.

B. $a \in [8, 11]$, $b \in [-28, -23]$, $c \in [56, 63]$, and $r \in [-445, -438]$.

C. $a \in [-51, -48]$, $b \in [-221, -216]$, $c \in [-1196, -1184]$, and $r \in [-6057, -6048]$.

D. $a \in [8, 11]$, $b \in [80, 92]$, $c \in [306, 313]$, and $r \in [1445, 1449]$.

E. $a \in [8, 11]$, $b \in [-25, -12]$, $c \in [-26, -11]$, and $r \in [-5, 1]$.
