

Below are some examples of how the basic precalculus questions from our presentation could be embellished to promote thinking in multiple representations. These were just our initial thoughts. Remember, other great examples were shared by you, the participants, during this session.

Exponential

Basic: A 2012 Ford Mustang GT is valued at \$11,000 and depreciates 10% per year. What is the value of the car in four years?

Embellished: You have \$8000 in the bank and are earning 5% per year. Your significant other's ex has \$6000 and is saving \$100 per month and also wants the car. When this situation is graphed, what do each of the intersection points mean? When would you be able to purchase the car? Who would be able to purchase the car first? How long would that person have to do so before the other could buy it?

Limits

Basic: Find $\lim_{x \rightarrow 2} \frac{2x^3 + 6x^2 - 20x}{x - 2}$.

Embellished activity: Create multiple limit problems that are similar to this one. Break the students into groups of four and have them create possible sketches of the graph, one being correct and three being incorrect (one graph per student in the group). Have them then trade these with another group. They should then choose the correct one for their new problem and describe how they know. Have them justify it analytically. Then, have them provide a situation that is modeled by this limit and solve it numerically.

Trigonometric

Basic: What is the new coordinate of the point (1,0) after it has been rotated 30° counter-clockwise on the unit circle?

Embellished: A Ferris wheel with a 20 foot radius takes three minutes to make one complete revolution. If you enter your car, which starts five feet off of the ground, how high off of the ground is your car after one minute if the ride turns counter-clockwise? Sketch this situation. What would a negative x-value mean in this situation? Find the times when you would be 10 feet off of the ground.

Sequences and Series

Basic: Consider the sequence 30, 33, 36, ... What is the sum of the first 35 terms?

Embellished: At a benefit concert to help provide funding for school building maintenance, an auditorium has 30 seats in its first row, 33 in the second, 36 in the third, and so on. A leak in the roof has caused the 10th and 11th rows to be closed. If the auditorium has 35 rows, how many people could attend the event? If each ticket cost x dollars, how much money would you have lost because of these two rows being closed? In complete sentences, describe by how much you would have to raise the price of a ticket to compensate for this loss.

Or

Describe a situation in which this sequence would be present. Graph out this sequence with the terms on the x-axis and the values on the y-axis. What one/two geometric shapes could we create from the area under this graph? What is/are the formula(s)? Use these formulas to find a total sum and describe what it means in the context of this situation. Prove that the formula you used is equivalent to the arithmetic sum formula from the text. $s_n = \frac{n}{2}(2a_1 + d(n - 1))$

Polar

Basic: What is the sum of the vectors $\mathbf{u}$ and $\mathbf{v}$ if $\mathbf{u} = (10, 135^\circ)$ and $\mathbf{v} = (5, 180^\circ)$?

Embellished: A boat leaves the bank of a river traveling at 10 mph in a direction 45° north of west. The river pushes it at 5 mph due west. Draw a graph of this situation and sketch the resultant vector. What is the meaning of the resultant vector? How far will the boat travel in just three minutes? Describe what a negative number means in this context.