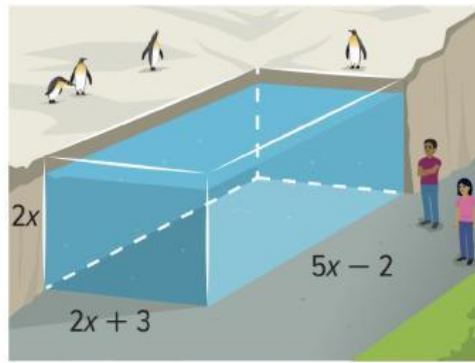**ANIMALS** For an exhibit with six or fewer Emperor penguins, the pool must have a depth of at least 4 feet and a volume of at least 1620 gallons, or about 217 ft³, per bird. If a zoo has five Emperor penguins, what should the dimensions of the pool shown at the right be to meet the minimum requirements?

$2x$

$5x - 2$

$2x + 3$

Part A Write a polynomial equation.

Use the formula for the volume of a rectangular prism, $V = \ell wh$, to write a polynomial equation that represents the volume of the pool. Let h represent the depth of the pool.

Since the minimum required volume for the pool is 217 ft³ per penguin, or $217 \cdot 5 = 1085$ ft³, the equation that represents the volume of the pool is $(2x + 3)(5x - 2)2x = 1085$. Simplify the equation.

$(2x + 3)(5x - 2)2x = 1085$	Volume of pool
$[2x(5x) + 2x(-2) + 3(5x) + 3(-2)]2x = 1085$	FOIL
$(10x^2 - 4x + 15x - 6)2x = 1085$	Simplify.
$(10x^2 + 11x - 6)2x = 1085$	Combine like terms.
$20x^3 + 22x^2 - 12x = 1085$	Distributive Property

So, the volume of the pool is $20x^3 + 22x^2 - 12x = 1085$.

Part B Write and solve a system of equations.

Set each side equal to y to create a system of equations.

$y = 20x^3 + 22x^2 - 12x$ First equation

$y = 1085$ Second equation

Enter the equations in the **Y =** list and graph.

Use the **intersect** feature on the **CALC** menu to find the coordinates of the point of intersection.

The real solution is the x-coordinate of the intersection, which is [ ]

Part C Find the dimensions.

Substitute 3.5 feet for x in the length, width, and depth of the pool.

Length: $2x + 3 =$ [ ]   Width: $5x - 2 =$ [ ]

Depth: $2x =$ [ ]