Warm-up!

The function $R$ is of the form $R(t) = at^2 + bt + c$

If $f(3) = 18$, write an equation relating $a$, $b$, and $c$ that must be true.

If $f(2) = 3$, write an equation relating $a$, $b$, and $c$ that must be true.

If $f(0) = -3$, write an equation that must be true.

Today:

- Solving Systems with Desmos (FRQ2A)
- More FRQ2B Practice

Homework: Solving Systems with Desmos

Our first test will be Sept 17th (Wednesday) and Sept 18th (Thursday)

$M(t)$ is of the form $M(t) = at^2 + bt + c$

It is given that $M(0) = -3$, $M(2) = 3$, and $M(3) = 18$.

A) Write a system of three equations that may be used to find the values of the constants $a$, $b$, and $c$ in the expression for $M(t)$.

B) Find the values for $a$, $b$, and $c$ as decimal approximations.

$R(t)$ is of the form $R(t) = at^3 + bt - \frac{c}{t}$

It is given that $R(1) = -30$, $R(4) = 45$, and $R(6) = 310$.

A) Write a system of three equations that may be used to find the values of the constants $a$, $b$, and $c$ in the expression for $R(t)$.

B) Find the values for $a$, $b$, and $c$ as decimal approximations.

$L(t)$ is of the form $L(t) = a + \frac{b}{t+1}$

It is given that $L(1) = -11$ and $L(6) = 40$.

A) Write a system of two equations that may be used to find the values of the constants $a$ and $b$ in the expression for $L(t)$.

B) Find the values for $a$ and $b$ as decimal approximations.

Mr. Souza posted a pic of the math team on Instagram, and it has gone viral. Every day, he checks how many new comments it got. On the day he posted it ($t = 0$), the post got $10$ comments. Two days later ($t = 2$), the post got $51$ new comments. Five days after posting ($t = 5$), the post got $45$ new comments.

Mr. Souza has reason to believe the number of new comments $t$ days after posting may be modeled well by $C(t) = at^2 + bt + c$.

A) Use the given data to write three equations that can be used to find the values for constants $a$, $b$, and $c$ in the expression for $C(t)$.

B) Find the values for $a$, $b$, and $c$ as decimal approximations.

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Mr. Souza has reason to believe the number of new comments $t$ days after posting may be modeled well by $C(t) = at^2 + bt + c$.

C) Find the average rate of change of the number of new comments over the interval $2 \leq t \leq 5$.

D) Use that average rate of change to predict the number of new comments the post got on day $t = 4$.

E) Is this an overapproximation or underapproximation of the value of $C(4)$?

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Mr. Souza has reason to believe the number of new comments $t$ days after posting may be modeled well by $C(t) = at^2 + bt + c$.

F) Explain why using the average rate of change from part C to predict the number new comments the post received for $2 < t < 5$ leads to underestimates

The iPad was introduced in 2010. Five years later ($t = 5$), $54.9$ million iPads were sold. Three years after that ($t = 8$), $43.5$ million iPads were sold. After that, Apple no longer shared sales numbers, but industry trackers believe that in 2023 ($t = 13$), $54.1$ million iPads were sold.

The number of iPads sold can be modelled by $S(t) = at^3 + bt^2 + ct + 7.5$, where $S(t)$ is the number of iPads sold, in millions, $t$ years after the launch of the product.

A) Use the data given to write three equations that can be used to find the values for the constants $a$, $b$, and $c$ in the expression for $S(t)$.

B) Find the values of $a$, $b$, and $c$ as decimal approximations.

The iPad was introduced in 2010. Five years later ($t = 5$), $54.9$ million iPads were sold. Three years after that ($t = 8$), $43.5$ million iPads were sold. After that, Apple no longer shared sales numbers, but industry trackers believe that in 2023 ($t = 13$), $54.1$ million iPads were sold.

The number of iPads sold can be modelled by $S(t) = at^3 + bt^2 + ct + 7.5$, where $S(t)$ is the number of iPads sold, in millions, $t$ years after the launch of the product.

C) Use the given data to find the average rate of change of the number of iPads sold, in millions, from $t = 8$ to $t = 13$. Express your answer as a decimal approximation. Show the computations that lead to your answer.

D) Use $S(13)$ and the average rate of change found in part C to estimate the number of iPads that will be sold in $2025$ ($t = 15$). Show the work that leads to your answer.

E) Does the value found in part D overestimate or underestimate the value of $S(15)$? Use the concavity of the graph of $S(t)$ to explain why this is the case.