Training for Quiz 1

Fundamentals of Calculus I

Explain and justify your thought process.

1. What's the slope of the line going through $(1, 2)$ and $(2, 10)$?

2. For $f(x) = 3x + 5$, find all solutions to $3x = f(x)$.

3. For $h(x) = x^2$, graph $h(x - 2) + 10$.

4. What's the minimum value of $x^2 + 6x + 20$?

   For questions 5 and 6, note Apple can build an iphone 6 factory for $100,000. Each iphone costs $100 to produce.

5. Express the cost of producing iphones as a linear function.

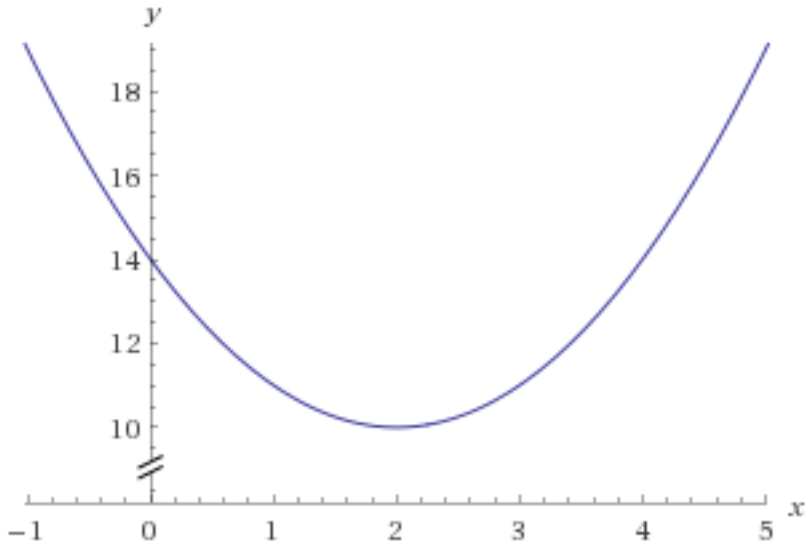
6. What's the total cost of producing 500 iphones?

Solutions

1. What's the slope of the line going through $(1, 2)$ and $(2, 10)$?
   Slope answers the question: how much does y change by when x increases by 1? When x inceases by 1, y increases from 2 to 10, implying the slope is 8.

2. For $f(x) = 3x + 5$, find all solutions to $3x = f(x)$.
   No solution, as the lines are parallel.

3. For $h(x) = x^2$, graph $h(x - 2) + 10$. It's the graph of x^2 shifted to the right by 2 and up by 10:



4. What's the minimum value of $x^2 + 6x + 20$?
   The function is a parabola, facing upwards. We can relate this function to x^2 by completing the square:

$$\begin{aligned} x^2 + 6x + 20 &= (x + 3)^2 + \_\_ \\ &= (x + 3)^2 + 11 \qquad \text{(since 9 + 11 = 20)} \end{aligned}$$

   Therefore, the function is x^2 shifted left by 3 and up by 11, meaning the minimum value is 11.

   For questions 5 and 6, note Apple can build an iphone 6 factory for $100,000. Each iphone costs $100 to produce.

5. Express the cost of producing iphones as a linear function.
   There's a fixed cost of 100,000 to build the factory, then 100 per iphone. Therefore, if we let x be the number of iphones we have: cost = 100 x + 100,000

6. What's the total cost of producing 500 iphones?
   We evaluate our function at an input of 500: cost = 100*500 + 100,000 = 50,000 + 100,000 = 150,000.