

# Common Review of Graphical and Algebraic Methods

The questions in this review are in pairs. An algebraic version followed by a graph version. Each pair has the same answers. However, do them separately to make sure you understand how to solve both the graph questions and the algebraic questions. If your answers match, you know that you got it right. Keep in mind that the graph answers will be approximate. There are a few questions which are beyond this course to solve algebraically. There is a note after each of those explaining partially why you can't solve them.

## Distance Questions

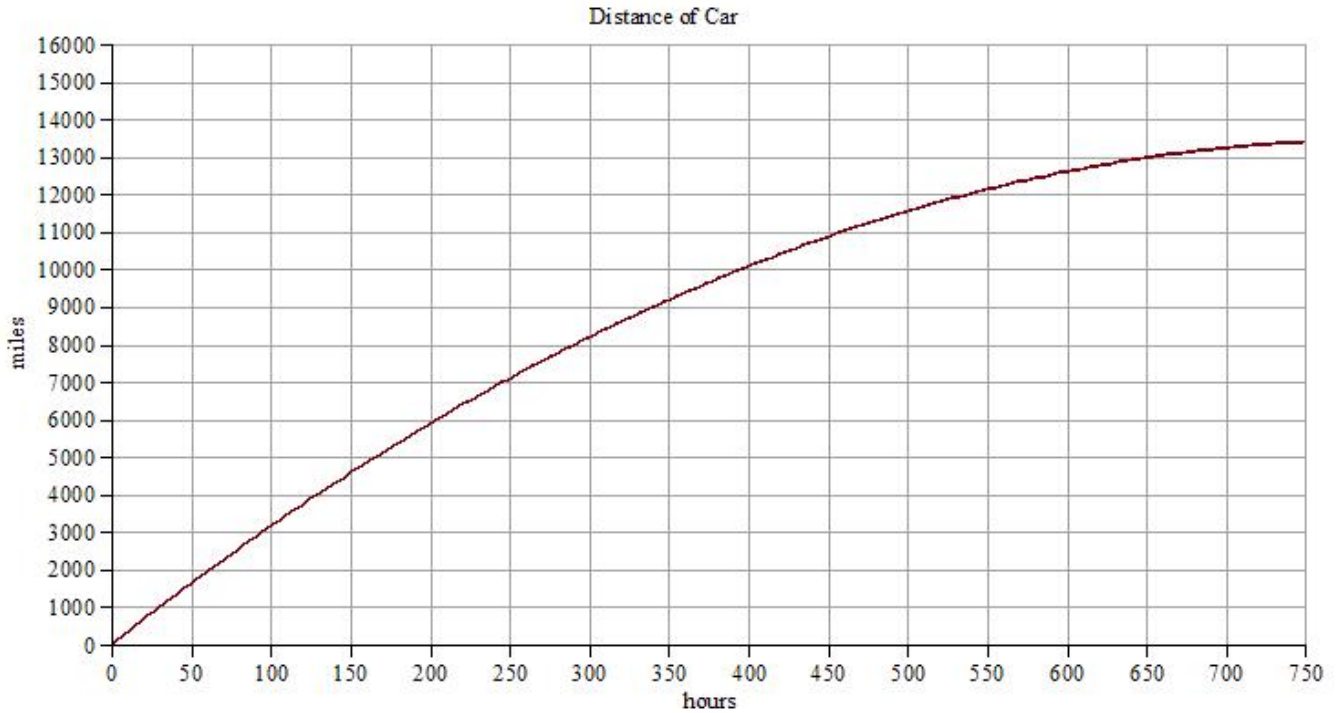
1. The distance travelled by a Car is given by the function

$$D(t) = -0.021t^2 + 33.6t$$

where  $D$  is in miles and  $t$  is in hours.

- (a) What is the total distance travelled by the Car at 350 hours? Yes, it is a very long trip.
- (b) What is the Average Trip Speed at 500 hours?
- (c) What is the Average Speed of the car between 200 and 600 hours?
- (d) At what time  $t$  is the Average Trip Speed equal to 25 miles per hour?
- (e) Find a 250 hour time interval when the Average Speed of the car is 15.75 miles per hour?
- (f) If a Truck starts 4000 miles ahead of the first one and travels at a constant speed of 15 miles per hour, when will the Car catch up with the Truck?

2. The distance travelled by a Car is given by the graph



Yes, it is a very long trip.

- (a) What is the total distance travelled by the Car at 350 hours?
- (b) What is the Average Trip Speed at 500 hours?
- (c) What is the Average Speed of the car between 200 and 600 hours?
- (d) At what time  $t$  is the Average Trip Speed equal to 25 miles per hour?
- (e) Find a 250 hour time interval when the Average Speed of the car is 15.75 miles per hour?
- (f) If a Truck starts 4000 miles ahead of the first one and travels at a constant speed of 15 miles per hour, when will the Car catch up with the Truck?

## Total Cost, Variable Cost, Revenue, Profit Questions

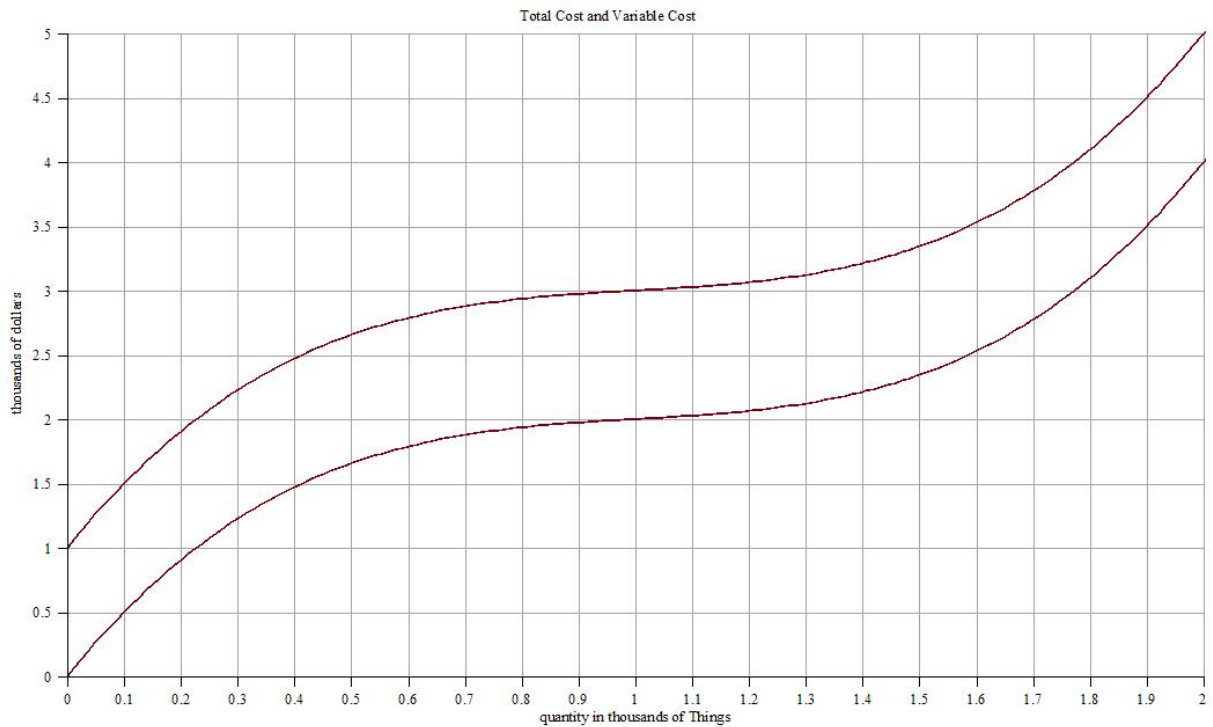
1. You produce and sell Things. The Total Cost for producing Things is given by

$$TC(q) = 1.75q^3 - 5.25q^2 + 5.5q + 1$$

where  $q$  is the number of thousands of Things and  $TC$  is in thousands of dollars.

- (a) What is the Total Cost of producing 300 Things?
- (b) What is the Variable Cost of Producing 300 Things?
- (c) What is the Fixed Cost?
- (d) What is the Average Cost at 200 Things?
- (e) What is the Average Variable Cost at 800 Things?
- (f) At what quantity  $q$  is the Average Variable Cost equal to 1.75 dollars per Thing?
- (g) At what quantity is the Average Cost Equal to 3 dollars per Thing?  
*Set up the equation only. You'll see it is a cubic when you simplify. You cannot solve it with what you already know.*
- (h) What is the Breakeven Price?  
*You have to find the minimum value of  $AC$  or solve  $AC = MC$  but neither can be solved using what you already know.*
- (i) What is the Marginal Cost at 400 Things? Remember  $q$  is in thousands of things and  $TC$  is in thousands of dollars.
- (j) What is the Shutdown Price?
- (k) If you sell each Thing for 3 dollars, when do you break even?  
*Set up the equation only. You'll see it is a cubic when you simplify. You cannot solve it with what you already know.*
- (l) If you sell each Thing for 3 dollars, what is the Maximum Profit?  
*First, you need to compute  $MC$  from  $TC$  like you did in part (i) with  $q$  in place of 400.*

2. You produce and sell Things. The Total Cost and Variable Cost for producing Things is given by the graphs



- What is the Total Cost of producing 300 Things?
- What is the Variable Cost of Producing 300 Things?
- What is the Fixed Cost?
- What is the Average Cost at 200 Things?
- What is the Average Variable Cost at 800 Things?
- At what quantity  $q$  is the Average Variable Cost equal to 1.75 dollars per Thing?
- At what quantity is the Average Cost Equal to 3 dollars per Thing?
- What is the Breakeven Price?
- What is the Marginal Cost at 400 Things?
- What is the Shutdown Price?
- If you sell each Thing for 3 dollars, when do you break even?
- If you sell each Thing for 3 dollars, what is the Maximum Profit?

## Marginal Cost, Average Variable Cost and Average Cost Questions

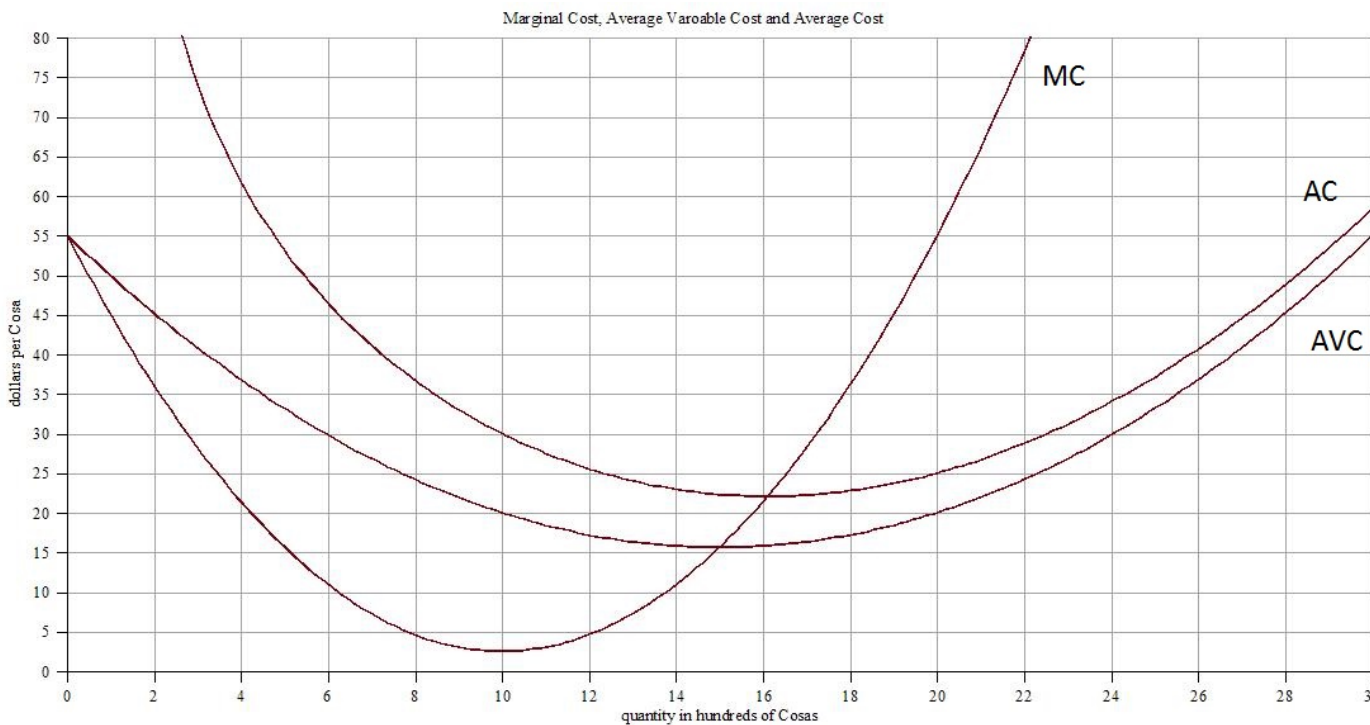
1. You produce and sell Cosas. The Marginal Cost and The Average Cost for  $q$  hundred Cosas are

$$MC(q) = 0.525q^2 - 10.5q + 55 \qquad AC(q) = 0.175q^2 - 5.25q + 55 + \frac{100}{q}$$

in dollars per Cosa.

- (a) What is the Average Cost at 800 Cosas?
- (b) What is the Average Variable Cost at 2000 Cosas?
- (c) What is the Marginal Cost at 1200 Cosas?
- (d) At what quantity  $q$  is the Average Variable Cost equal to 30 dollars per Cosa?
- (e) At what quantity  $q$  is the Average Cost equal to 25 dollars per Cosa?  
*Set the equation up to solve this. When you simplify, it becomes a cubic equation. You cannot solve it with what you already know.*
- (f) At what quantity is the Marginal Cost equal to 5 dollars per Cosa?
- (g) What is the Total Cost of producing 1000 Cosas?
- (h) What is the Variable Cost of Producing 600 Cosas?
- (i) What is the Fixed Cost?
- (j) What is the Shutdown Price?
- (k) What is the Breakeven Price?  
*Set the equation up to solve this. When you simplify, it becomes a cubic equation. You cannot solve it with what you already know.*
- (l) If you sell each Cosa for 40 dollars, what is the maximum profit?

2. You produce and sell Cosas. The Marginal Cost, the Average Cost and the Average Variable Cost are given by the following graph.



- (a) What is the Average Cost at 800 Cosas?
- (b) What is the Average Variable Cost at 2000 Cosas?
- (c) What is the Marginal Cost at 1200 Cosas?
- (d) At what quantity  $q$  is the Average Variable Cost equal to 30 dollars per Cosa?
- (e) At what quantity  $q$  is the Average Cost equal to 25 dollars per Cosa?
- (f) At what quantity is the Marginal Cost equal to 5 dollars per Cosa?
- (g) What is the Total Cost of producing 1000 Cosas?
- (h) What is the Variable Cost of Producing 600 Cosas?
- (i) What is the Fixed Cost?
- (j) What is the Shutdown Price?
- (k) What is the Breakeven Price?
- (l) If you sell each Cosa for 40 dollars, what is the maximum profit?