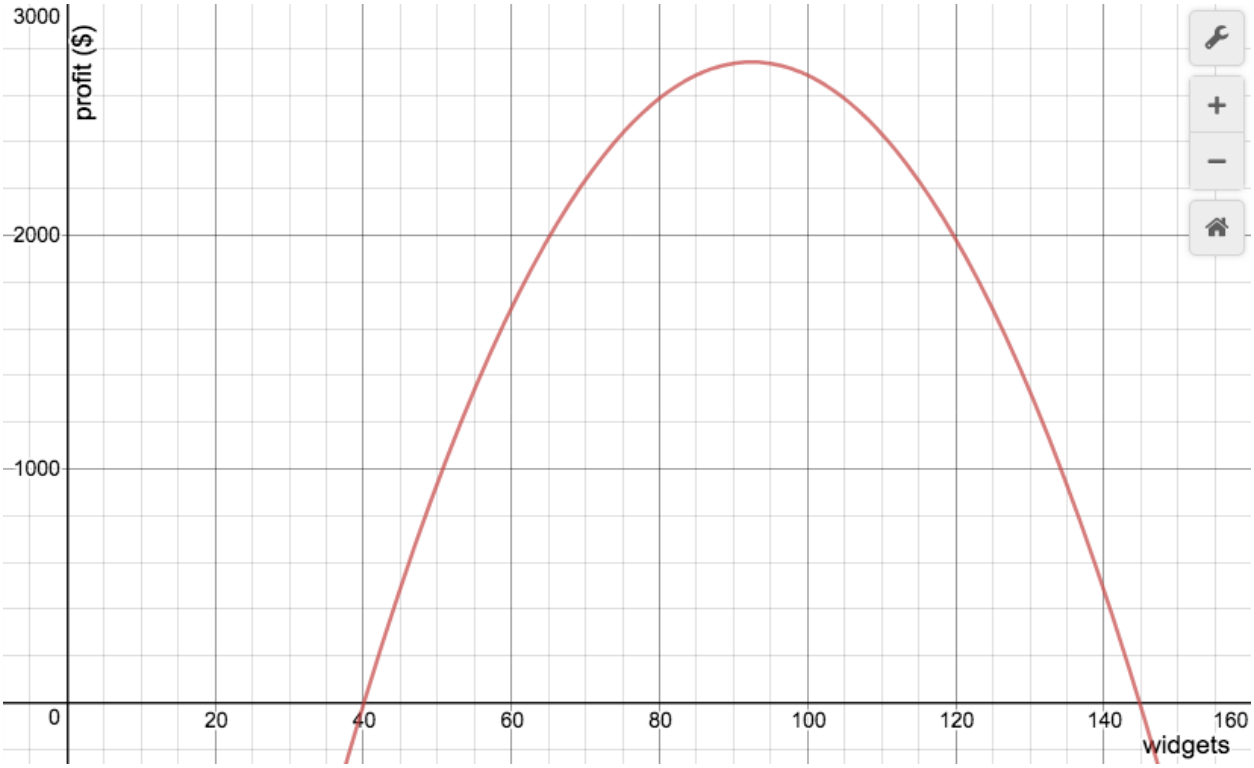
Math 1483: Exam 1 study guide

Extra Review Session: Wednesday, 2/13, 4 pm to 5:30 pm (MLSC West Room, 5th floor of library)

Problems 1-5 refer to the following situation:

The formula $P(n) = -5805.1 + 184.9n - n^2$ gives the profit P (in thousands of US dollars) that your company makes when you produce n widgets. The graph of this function is shown below.



Problem 1. As production increases from $n = 65$ to $n = 95$ widgets, by how much do profits change?

(a) \$30,000
(b) \$747,000
(c) \$1,988,400
(d) \$2,735,000
(e) None of these

Problem 2. What constant (average) rate of change results in such a change in P on this production interval?

(a) \$66,280 per magic carpet
(b) \$91,166.67 per magic carpet
(c) \$1,000 per magic carpet
(d) \$24,900 per magic carpet
(e) None of these

Problem 3. According to this function, at how many widgets does profit equal 0? Give an EXACT answer, not an estimate from the graph.

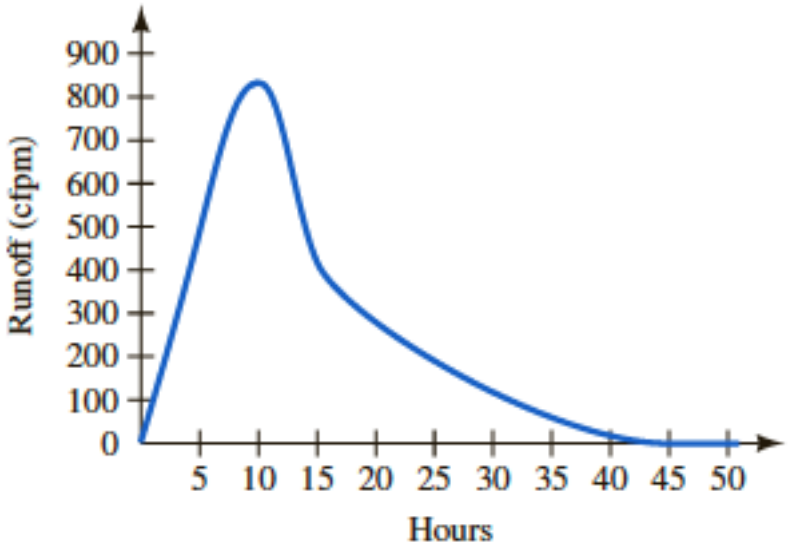
Problem 4. Which of the following descriptions of the function's behavior on the production interval from $n = 100$ to $n = 150$ widgets is accurate?

(a) Increasing at an increasing rate
(b) Increasing at a decreasing rate
(c) Increasing at a constant rate
(d) Decreasing at an increasing rate
(e) Decreasing at a decreasing rate
(f) Decreasing at a constant rate

Problem 5. What number of widgets maximizes profit? Give an EXACT answer, not an estimate from the graph.

Problems 6, 7, 8, 9, 10, and 11 refer to the following graph.

When rainfall brings more water than soil can absorb, runoff occurs. The graph below shows the runoff, in cubic feet per minute (cfpm) being dumped into the mouth of a stream t hours since the rain started.



Problem 6. Over what period of time does the runoff decrease?

Problem 7. Over what period of time does the runoff increase?

Problem 8. Does this graph have an inflection point? If so, what is it?

Problem 9. Interpret the function's behavior at the inflection point.

(a) At the inflection point, the runoff is increasing the least rapidly.
(b) At the inflection point, the runoff is increasing the most rapidly.
(c) At the inflection point, the runoff is decreasing the least rapidly.
(d) At the inflection point, the runoff is decreasing the most rapidly.
(e) At the inflection point, the runoff is greater than the number sold in any other day.
(f) At the inflection point, the runoff is less than the number sold in any other day.
(g) At the inflection point, the runoff is the same as the number sold in any other day.

Problem 10. At what time(s) is there 400 cfpm of runoff?

Problem 11. Does this function have a limiting value?

(a) Yes, about 850 cfpm
(b) Yes, about 12 hours
(c) Yes, about 400 cfpm at 15 hours
(d) Yes, 45 hours
(e) Yes, 50 hours
(f) Yes, 0 cfpm

Problem 12. If we stand atop a 150 foot tall building and throw a ball into the air with an initial velocity of 22 feet per second, then the height of the ball above the ground is given by

$$H(t) = -16t^2 + 22t + 280.$$

Here t is time in seconds and H is measured in feet. The function is valid from time 0 until the time the ball hits the ground.

A. When does the ball hit the ground?

B. What is the maximum height the ball reaches?

Problem 13. The table below shows the minimum wage in the US as a function of time. The wage is adjusted for inflation.

Year	1950	1960	1970	1980	1990	2000	2010
Minimum wage ($)	7.01	7.59	9.28	8.46	6.66	6.90	7.67

a. Find the average rate of change of minimum wage from 1980 to 1990. INCLUDE UNITS IN YOUR ANSWER!

b. Use the average rate of change to estimate the minimum wage in 1983.

Problem 14. Solve the following equation for c:

$$P = -5 - 1.5c$$

Problem 15. The equation G(p, s, a) = 4.25p +1.25s + 0.80a + 5 tells you the cost of your grocery bill as a function of the number of pizzas, p, sodas, s, and apples, a, that you buy. You also had to pay a flat rate for the bus fare to and from the store.

a. What are the independent variables? What is the dependent variable?

b. How much is one pizza?

c. How much was the bus fare?

Problem 16. Dr. Dorko's chocolate chip cookie recipe says it will take her 10 minutes to preheat the oven to 350 degrees for her cookies. Each pan of cookies takes 9 minutes to bake.
a. Write an equation that represents the total time *T* Dr. Dorko's oven will be on if she bakes *c* pans of cookies.

b. Dr. Dorko's oven was on for 91 minutes. How many pans of cookies did she bake?