Preface

Here are a set of problems for my Calculus I notes. These problems do not have any solutions available on this site. These are intended mostly for instructors who might want a set of problems to assign for turning in. I try to put up both practice problems (with solutions available) and these problems at the same time so that both will be available to anyone who wishes to use them.

As with the set of practice problems I write these as I get the time and some sections will have only a few problems at this point and others won’t have any problems in them yet. Rest assured that I’m always trying to get more problems written but this site has been written and maintained in my spare time and so I usually cannot devote as much time as I’d like to the site.

Business Applications

1. A company can produce a maximum of 2500 widgets in a year. If they sell \( x \) widgets during the year then their profit, in dollars, is given by,

\[
P(x) = 500,000,000 - 1,540,000x + 1450x^2 - \frac{1}{3}x^3
\]

How many widgets should they try to sell in order to maximize their profit?

2. A company can produce a maximum of 25 widgets in a day. If they sell \( x \) widgets during the day then their profit, in dollars, is given by,

\[
P(x) = 3000 - 40x + 11x^2 - \frac{1}{3}x^3
\]

How many widgets should they try to sell in order to maximize their profit?

3. A management company is going to build a new apartment complex. They know that if the complex contains \( x \) apartments the maintenance costs for the building, landscaping etc. will be,

\[
C(x) = 70,000 + \frac{2736}{5} x - \frac{211}{30} x^2 + \frac{1}{150} x^3
\]

The land they have purchased can hold a complex of at most 400 apartments. How many apartments should the complex have in order to minimize the maintenance costs?
4. The production costs of producing $x$ widgets is given by,

$$C(x) = 2000 + 4x + \frac{90,000}{x}$$

If the company can produce at most 200 widgets how many should they produce to minimize the production costs?

5. The production costs, in dollars, per day of producing $x$ widgets is given by,

$$C(x) = 400 - 3x + 2x^2 + 0.002x^3$$

What is the marginal cost when $x = 20$ and $x = 75$? What do your answers tell you about the production costs?

6. The production costs, in dollars, per month of producing $x$ widgets is given by,

$$C(x) = 10,000 + 14x - \frac{8,000,000}{x^2}$$

What is the marginal cost when $x = 80$ and $x = 150$? What do your answers tell you about the production costs?

7. The production costs, in dollars, per week of producing $x$ widgets is given by,

$$C(x) = 65,000 + 4x + 0.2x^2 - 0.00002x^3$$

and the demand function for the widgets is given by,

$$p(x) = 5000 - 0.5x$$

What is the marginal cost, marginal revenue and marginal profit when $x = 2000$ and $x = 4800$? What do these numbers tell you about the cost, revenue and profit?

8. The production costs, in dollars, per week of producing $x$ widgets is given by,

$$C(x) = 800 + 0.008x^2 + \frac{56,000}{x}$$

and the demand function for the widgets is given by,

$$p(x) = 350 - 0.05x - 0.001x^2$$

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What is the marginal cost, marginal revenue and marginal profit when \( x = 175 \) and \( x = 325 \)? What do these numbers tell you about the cost, revenue and profit?