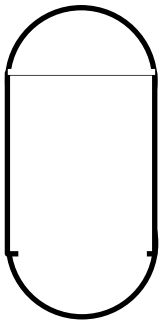
Practice Optimization and Derivative Interpretation Name _____

1. A rectangular field is fenced off along the bank of a river with no fence required along the river. The material for the fence costs 8$ per foot for the side parallel to the river and 2$ per foot for the sides perpendicular to the river. What should the dimensions of the enclosure be to maximize the area, if the total cost of the fence is 2500$?

2. A window that is capped with a semi-circle on the top and bottom as shown has a perimeter of 16 ft. Find the radius of the circle if the area is to be a maximum.



3. Your company needs design cylindrical metal containers with a volume of 12 cubic feet. The top and bottom are made of a sturdy material costing 3$ per square foot while the side can be made of a thinner material costing 1$ per square foot. Find the height, radius and cost of the least expensive container possible.

4. A field 160000 square feet is too be enclosed by a fence on all 4 sides. Metal fencing costing 12$ per foot will be used for the side facing the road. A cheaper fence costing 5$ per foot can be used for the remaining 3 sides. What should the dimensions of the field be to minimize the cost of the fence?

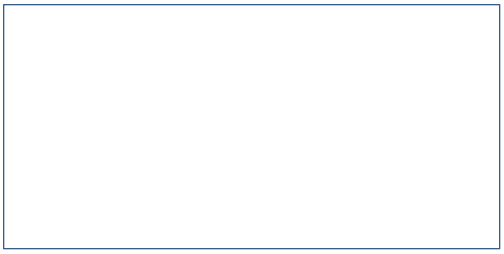
5. A plum orchard now has 30 trees per acre and an average yield of 300 plums per tree. For each additional tree planted the yield will decrease by 8 apples per tree. How many trees per acre will maximize the crop?

6. A closed rectangular box with a square base has an volume of 1000 cm cubed. The material for the top and bottom costs $2 per square cm while the sides cost 1$ per square cm. Find the dimensions that will lead to the minimum cost.

7. A manufacturer wants to design an open box with a square base that has a surface area of 108 square inches. What dimensions will produce a box with maximum volume?

DERIVATIVE INTERPRETATION

Consider $f'(x)=x\cos(0.65x)$ on the interval [-4,3].



1. Draw a labeled diagram in the box.
2. Where is f concave up?
3. Name x-values of the point(s) of inflection on f?
4. Name x-values of the point(s) of inflection of f'?
5. Where is f concave down and increasing?
6. Find $f'''(2.35)$.

Consider $f''(x)=\frac{2}{e^{0.6x}}-\cos(0.25x)$ on the interval [-1,9].

7. Draw a labeled diagram in the box.
8. Where is f concave down?
9. Name x-values of the point(s) of inflection of f?
10. Name x-values of the point(s) of inflection of f'?
11. Where is f' concave up and decreasing?
12. Find $f'''(2.35)$.

Answers

Optimization

1. 156.25 ft by 312.5 ft
2. 2.546
3. R = .860, h = 5.16, Cost = $41.85
4. 306.79 ft by 521.54 ft
5. 34 trees!
6. 7.94cm by 7.94 cm by 15.87 cm
7. 6 in by 6 in by 3

Derivative Interpretation

1. –
2. (-1.313, 1.324)
3. x = -1.323, 1.324
4. 0, -3.521 (you need to graph f'' !)
5. (-4, -1.323), (1.324, 2.650)
6. -1.341
7. –
8. (1.236, 6.074)
9. 1.236 and 6.074
10. 3.177
11. (3.177, 6.074)
12. -0.154