

MATH 234 AL1 SECOND EXAM

THURSDAY, OCTOBER 18TH, 2007, 9AM

Name: _____ Section: _____

Show all work for full credit. No calculators are allowed.

Problem	Score
1	
2	
3	
4	
5	
6	
Total	of 100

You may need one or more of the following formulas:

Circle: $A = \pi r^2$, $C = 2\pi r$;

Cylinder: $V = \pi r^2 h$, $S_A = 2\pi r^2 + 2\pi r h$;

Sphere: $V = \frac{4}{3}\pi r^3$, $S_A = 4\pi r^2$;

Box: $V = xyz$; $S_A = 2xy + 2yz + 2zx$.

Problem 1 (15 pts). A spherical balloon is being filled with helium at a rate of $5\text{in}^3/\text{second}$. When the radius of the balloon is $r = 10$ inches, at what rate is the surface area increasing?

Problem 2 (10 pts each). Let the cost and demand functions of a particular commodity be given by $C(x) = 10x^2 + 100$ and $p(x) = 5x + 40$, respectively.

- (1) Find the production level x that maximizes profit.
- (2) Find the production level x that minimizes average cost.

Problem 3 (10 pts each). Find $\frac{dy}{dx}$

(1) $y = \sqrt{(2x + 1)^2 - 1}$

(2) $xy = x^3 + y^3$.

Problem 4 (10 pts each). Consider the following function:

$$f(x) = (x^2 - 3)^2$$

- (1) Find the interval(s) where the function is concave up and the interval(s) where it is concave down.
- (2) Identify the inflection points. Justify.

Problem 5 (10 pts). Use the second derivative test to classify the critical points of the function

$$f(x) = 2x + \frac{8}{x}.$$

Problem 6 (15 pts). A closed cylindrical container is constructed with two types of cardboard. The first type is used for the top and bottom and costs 4 cents per cm^2 and the second type, used for the sides, costs 2 cents per cm^2 . If the container is to have volume 32π , what dimensions minimize the construction cost?