

**Midterm 1: February 13, 2008****Free Response**

1. Sketch the region enclosed by  $y = 4 - x^2$  and  $y = x^2 - 2$ . Decide whether to integrate with respect to  $x$  or  $y$ . Find the area of the region.
2. Find the volume of the solid obtained by rotating the region bounded by  $y = \sqrt{x}$  and  $y = x$  about the line  $y = 0$ .
3. The linear density of a 15 m long rod is  $\rho(x) = \frac{8}{(3+x)^2}$  kg/m, where  $x$  is measured in meters from one end of the rod. Find the average density of the rod.
4. Use the method of cylindrical shells to find the volume of a solid obtained by rotating the region bounded by the given curves about the  $y$  axis.

$$y = 3x - x^2, y = 0$$

**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

- \_\_\_\_\_ 5. A spring has a natural length of 22 cm. If a force of 15 N is required to keep it stretched to a length of 32 cm, how much work is required to stretch it from 22 cm to 40 cm? Force to pull spring is given by  $F(x) = k(x - x_0)$

Select the correct answer.

- a. 3.43 J
- b. 1.93 J
- c. 2.93 J
- d. 3.93 J
- e. 2.43 J

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**Answer Section**

**FREE RESPONSE**

1. ANS:  
13.86

PTS: 1

2. ANS:  
 $\frac{\pi}{6}$

PTS: 1

3. ANS:  
9

PTS: 1

4. ANS:  
 $13.5\pi$

PTS: 1

**MULTIPLE CHOICE**

5. ANS: E                      PTS: 1