

**Math 132 - Test 1**  
September 21, 2022

Name \_\_\_\_\_

Score \_\_\_\_\_

Show all work to receive full credit. Supply explanations where necessary. Unless otherwise indicated, do all integration by hand.

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1. (12 points) Find the area of the bounded region between the graphs of  $y = 2x^2 - 4$  and  $y = x^2 - x - 2$ .

2. (10 points) The 4th-quadrant region bounded by the graphs of  $y = -x^2$ ,  $y = 0$ , and  $x = 3$  is rotated about the  $y$ -axis to form a solid. Find the volume of the solid.

3. (12 points) A triangular region in the  $xy$ -plane has vertices at  $(0, 0)$ ,  $(1, 2)$ , and  $(3, 0)$ . The region is rotated about the  $x$ -axis to form a solid. Use our calculus techniques to find the volume of the solid.

4. (10 points) Set up the definite integral that gives the length of the graph of  $y = x^{3/2}$  from  $x = 0$  to  $x = 1$ . Evaluate your definite integral by hand, showing all work.

5. (5 points) The graph of  $y = x^{3/2}$  from  $x = 0$  to  $x = 1$  is rotated about the  $x$ -axis to form a surface. Set up the definite integral that gives the area of the surface. Then use your calculator to approximate the value of the integral.

6. (3 points) The graph of  $y = x^{3/2}$  from  $x = 0$  to  $x = 1$  is rotated about the  $y$ -axis to form a surface. Set up the definite integral that gives the area of the surface. Do not evaluate the integral.

7. (16 points) Consider the 1st-quadrant region bounded by the graphs of  $y = e^x$ ,  $y = 1$ , and  $x = 2$ .

(a) Sketch the region.

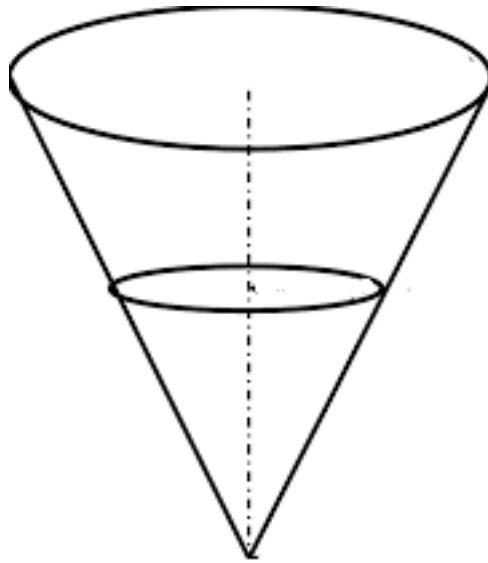
(b) The region is rotated about the  $x$ -axis to form a solid. Set up, **but do not evaluate**, a definite integral that gives the volume of the solid.

(c) The region is rotated about the line  $x = -3$  to form a solid. Set up, **but do not evaluate**, a definite integral that gives the volume of the solid.

(d) The region is rotated about the line  $y = 8$  to form a solid. Set up, **but do not evaluate**, a definite integral that gives the volume of the solid.

8. (10 points) Chain that weighs 4.25 lb/ft is used to lift a 75-lb rock out of a hole that is 17 ft deep. Determine the work required.

9. (10 points) A tank has the shape of a circular cone with its point down. The tank is 4 m tall, and its radius at the top is 1.5 m. It is filled to a height of 3 m with water weighing  $9800 \text{ N/m}^3$ . Compute the work required to pump the water over the top of the tank.



10. (12 points) The base of a solid lies in the  $xy$ -plane over the region bounded by the upper half of the ellipse  $\frac{x^2}{16} + \frac{y^2}{9} = 1$  (see the graph below). Each cross section of the solid perpendicular to the  $y$ -axis is a rectangle whose height at  $y$  is  $y$ . (A dashed strip is shown at a random  $y$ -value.) Find the volume of the solid.

