

Calculus III - Spring 2015 - Mr. Clontz - Test 1
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Name: \_\_\_\_\_ Class: \_\_\_\_\_

- Write complete solutions for each of the given problems. You may cite definitions or theorems from the notes rather than rewrite them.
- This exam is open-“everything”, provided you do not plagiarize.
- Write your solutions so that an A-student in Cal 1 and Cal 2 who has never seen that type of problem before could follow your work.
- Individual Test: You will have 40 minutes to complete this test on your own. You may not communicate with anyone during this period.
- Group Test: You will have 40 minutes to complete an identical test. You may collaborate with your group members during this time. All solutions must still be written by yourself, and may not be directly copied from another student.

1. (5 points) Compute the angle between the vectors  $\vec{\mathbf{u}} = \langle 2, 2\sqrt{3} \rangle$  and  $\vec{\mathbf{v}} = \langle -5, 0 \rangle$ .

2. (5 points) Find an equation for the plane passing through  $(0, 0, 0)$ ,  $(1, 0, -3)$ , and  $(-2, 3, 0)$ .

3. (5 points) Sketch  $x^2 + 9y^2 - 4z^2 = 16$  and its traces in the planes  $x = 0$ ,  $y = 0$ , and  $z = 0$ . Then use these traces to name the quadric surface.

4. (5 points) Explain why the parametric equations  $x = 4 \sin t$  and  $y = \cos t$  yield points on the ellipse  $x^2 + 16y^2 = 16$ .

5. (5 points) Find  $\vec{\mathbf{r}}(t)$  given  $\vec{\mathbf{r}}'(t) = \langle 4t^3, -\sin t, e^t \rangle$  and  $\vec{\mathbf{r}}(0) = \langle 1, 2, 3 \rangle$ .

6. (5 points) Recall from the notes that the work done by moving an object along the displacement vector  $\vec{\mathbf{D}}$  using a force vector  $\vec{\mathbf{F}}$  is given by

$$W = \vec{\mathbf{F}} \cdot \vec{\mathbf{D}}$$

Use this formula to show how much work is done in moving an object from the point  $(1, 3)$  to the point  $(4, 7)$  using a force of magnitude 10 units oriented in the positive  $y$ -direction.