

Each problem is worth 0 points. In the event of an actual quiz, you would have received warning.

1. Consider the paraboloid  $z = x^2 + y^2$ , with upward orientation, and let  $S$  be the portion below  $z = 16$ . Describe the boundary, parametrize it, and explain which way it should be orientated.

The boundary is the circle  $x^2 + y^2 = 16$  in the plane  $z = 16$ , which can be parametrized by  $\mathbf{r}(t) = \langle 4\cos t, 4\sin t, 16 \rangle$  for  $t$  values starting at 0 and ending at  $2\pi$ . This corresponds to counterclockwise orientation when viewed from above, so that traversing the boundary in this direction has the positively oriented portion of the surface on the left.

2. Consider the sphere with radius 3 centered at the origin, with outward orientation, and let  $S$  be the portion where  $y \geq 0$ . Describe the boundary, parameterize it, and explain which way it should be oriented.

The boundary is the circle  $x^2 + z^2 = 9$  in the plane  $y = 0$ , which can be parametrized by  $\mathbf{r}(t) = \langle 3\sin t, 0, 3\cos t \rangle$  for  $t$  values starting at 0 and ending at  $2\pi$ . This corresponds to counterclockwise orientation when viewed from the positive  $y$ -axis, so that traversing the boundary in this direction has the positively oriented portion of the surface on the left.

