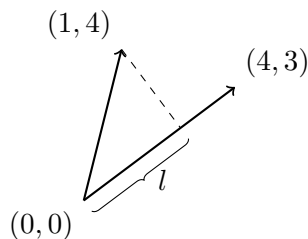


# MATH 335 S2019

## Practice Midterm Exam I

Read the problems carefully and be sure to show your work. No cell phones or calculators are allowed. Please turn off your phone to avoid any disturbances.

1. Compute the area between the curves  $y = x^3$  and  $y = \sqrt{x}$  for  $0 \leq x \leq 1$ .
2. What is the work done by the force  $\vec{F}(\vec{r}) = (0, 0, r_3^2)$  in moving from  $(1, 0, 0)$  to  $(0, 2, 0)$ ?
3. Complete the following
  - (a) Find an implicit equation for the plane containing both of the lines  $\vec{l}_1(t) = (1, 0, 1) + t(-1, -1, 1)$  and  $\vec{l}_2(t) = (0, 2, 0) + t(-1, -1, 1)$ .
  - (b) Let the curve  $C$  be the unit circle in the  $(x, y)$  plane. If  $\vec{r}(t)$  is a parameterization of the circle which traces it counter-clockwise, does  $\vec{r} \times d\vec{r}/dt$  point in the positive or negative  $z$  direction?
  - (c) Compute the length  $l$  below



- (d) Compute the integral  $\int_0^{2\pi} x \sin x \, dx$ .
4. (a) Consider the surface  $S$  where  $x^2 + y^2 = 1$  and  $0 \leq z \leq 1$  (a tube). Compute the flux
 
$$\iint_S \vec{F} \cdot \hat{n} \, dS, \tag{1}$$
 where  $\vec{F}(x, y, z) = (y, z^3y, x)$ .
  - (b) Compute the volume of the tube above  $z = 0$  and below the plane through the points  $(1, 0, 1)$ ,  $(-1, 1, 0)$ ,  $(-1, -1, 0)$ .