

Show all work and include units where appropriate. You have 30 minutes to complete this quiz. (25 pts)

1. Circle “True” if the statement is always true. Otherwise, circle “False”. Include a brief explanation for your answer. (3 pts each)

(a) If  $f(x)$  is a continuous, decreasing function for  $x \geq 1$ , then  $\int_1^\infty f(x)dx$  is convergent.

True

False

(b) The point given in Cartesian coordinates by  $\left(-\frac{\sqrt{3}}{4}, -\frac{1}{4}\right)$  can be expressed in polar coordinates as  $r = \frac{1}{2}, \theta = \frac{\pi}{6}$ .

True

False

(c) The parametric equations  $x(t) = 3 + t^2, y(t) = 4 + 2t^2$  describe a parabola.

True

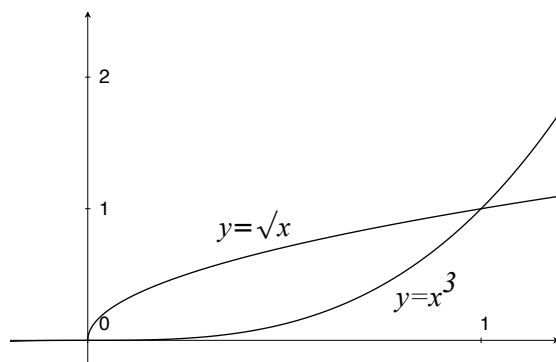
False

2. Find the value of the constant  $C$  for which the integral

$$\int_0^{\infty} \left( \frac{2x}{x^2 + 1} - \frac{C}{2x + 1} \right) dx$$

converges. Evaluate the integral for this value of  $C$ . (Hint: You will find the properties of logarithms very useful.) (7 pts)

3. Consider the region below bounded by the curves  $y = \sqrt{x}$  and  $y = x^3$ .



Set up, but DO NOT EVALUATE, definite integrals giving the values of the quantities indicated. Circle or box your final answer. (3 pts each)

- (a) The volume of the solid obtained by revolving the region about the  $y$ -axis.
- (b) The volume of the solid obtained by revolving the region about the line  $y = 2$ .
- (c) The perimeter of the region.