

Exam I

Name \_\_\_\_\_

1. (5pts each) Differentiate the following functions

(a)  $f(x) = \sqrt{25 - x^2}$

(b)  $f(x) = 5e^{-0.2x} \sin(0.2x)$

(c)  $f(x) = \int_3^{7x} e^{-2u} \cos(2u) du$

2. (5 pts each) Integrate the following

(a)  $\int 4e^{2x} \sqrt{1 - 2e^x} dx$

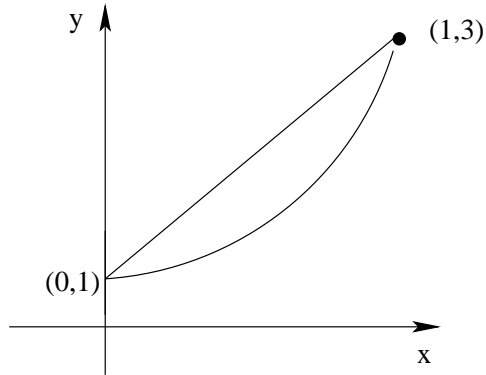
(b)  $\int \frac{6x}{\sqrt{1 - x^2}} dx$

(c)  $\int_0^{\pi/2} \frac{\cos t}{1 + \sin t} dt$

(d)  $\int x\sqrt{2+x} dx$

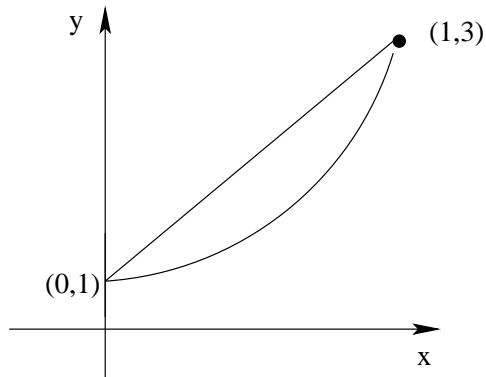
3. (5pts) Set up the integral to determine the average value of the function  $f(x) = x \arctan x$  on the interval  $[1, 4]$ .

4. (a) (10 pts) Determine the area of the shown region bounded by the curves  $y = 3^x$  and  $y = 2x + 1$ .



- (b) (10 pts) Set up (do not evaluate) the integral for the volume of the solid formed by rotating the region in part (a) about the  $y$ -axis.

- (c) (10 pts) Set up (do not evaluate) the integral for the volume of the solid formed by rotating this region bounded by  $y = 3^x$  and  $y = 2x + 1$  about the  $x$ -axis.



5. (10 pts) Set up (do not evaluate) the integral to determine the work needed to empty a full tank of water ( $62.4\text{lb}/\text{ft}^3$ ) from the top. The tank is parabolic with radius 2 ft and height 16 ft. (In other words, it curves to map the function  $y = 4x^2$ .)

