

## MA 125 CT, CALCULUS I

Test 3, November 10, 2016

Name (Print last name first): .....

Show all your work and justify your answer!
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No partial credit will be given for the answer only!
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PART I
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You must simplify your answer when possible.

All problems in Part I are 8 points each.

1. Evaluate  $\int \sqrt{x}(x^3 + 1) dx$ .

2. Evaluate  $\int \frac{x^3 + 1}{x^6} dx$ .

3. Evaluate  $\int_0^1 x^2 \sin(2x^3 + 1) dx$

4. Evaluate  $\int_{-17}^{17} \frac{x}{x^6 + 2x^2 + 1} dx$ .

5. Use the Fundamental Theorem of Calculus to give an example of an anti-derivative of the function  $f(x) = \sin(x^2 + 1)$

6. Use a Riemann sum with  $n = 4$  terms and the midpoint rule to approximate the value of  $\int_1^2 \frac{1}{x} dx$ .

7. Find the average value of the function  $f(x) = 3x^2 - 2x$  on  $[0, 1]$ .

**PART II**

1. [14 points] Evaluate  $\int \frac{(x+2)^2}{(1-x)^{27}} dx$

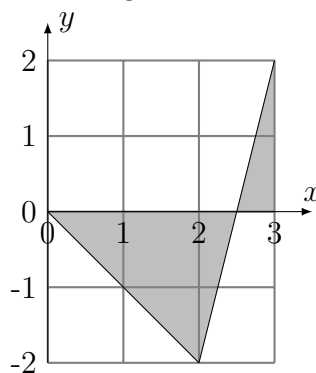
2. [16 points] Suppose the graph of a function  $y = f(x)$  is shown in the plot below.

(i) Find the value of its integral:  $\int_0^3 f(x) dx$

(ii) Let  $g(x) = \int_0^x f(t) dt$ . What is the derivative  $g'(1)$ ?

(iii) State the intervals where  $g(x)$  is increasing and where it is decreasing. [As always you must explain your answer!]

The area of a triangle is  $\frac{1}{2} \cdot \text{base} \cdot \text{height}$



3. [14 points] If the velocity of a particle is given by  $v(t) = t^2 - t$  and the position  $S(0) = 3$ .
- (a) Find a formula for the position  $S(t)$  at time  $t$ .
  - (b) Find the displacement of the particle on  $[0, 2]$ .
  - (c) Find the total distance traveled by the particle on  $[0, 2]$ .

Scratch paper