MA 125 6C, CALCULUS I

Test 3, November 8, 2017

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

Show all your work and justify your answer!

No partial credit will be given for the answer only!

PART I

You must simplify your answer when possible but you do not need to add and/or multiply numbers. All problems in Part I are 8 points each.

1. Evaluate $\int \sqrt[3]{x}(x+1)\,dx$.

2. Evaluate $\int (1+\tan(x))^5 \sec^2(x)\,dx$.

3. Evaluate $\int_0^1 x^4\sqrt{2x^5+1}\,dx$

4. Evaluate $\int_{-1}^1 \dfrac{\sin(x)}{x^2+1}\,dx$.

5. Use the Fundamental Theorem of Calculus to define an anti-derivative of the function $f(x) = \sqrt[5]{x^2+1}$

6. Use a Riemann sum with $n = 3$ terms and the midpoint rule to approximate the value of $\int_1^2 \sin(x^2)\,dx$. **You do not need to add the terms in the sum!**

7. Find the average value of the function $f(x) = \sin(x)$ on $[0, \pi]$.

PART II

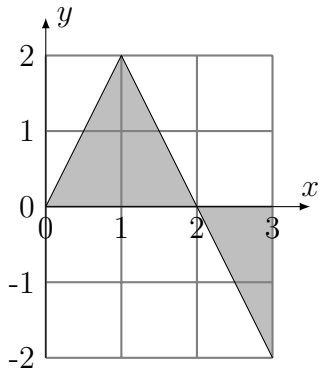
1. **[14 points]** Evaluate $\int \frac{\sin(\frac{1}{x})}{x^2}\,dx$

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 acceleration of a particle is given by $a(t) = 36t^2 + 36t$ and the velocity and position at time $t = 0$ are $v(0) = 3$ and $S(0) = 1$.

   (a) Find a formula for the velocity $v(t)$ at time t.

   (b) Find a formula for the position $S(t)$ at time t.

   (c) Find the **total** distance traveled by the particle on the interval $[-1, 1]$.

Scratch paper