MA 125 CT,   CALCULUS I
Test 3, March 29, 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.

All problems in Part I are 8 points each.

1. Evaluate $\displaystyle\int \sqrt[3]{x}(x^2 + 1)\, dx$.

2. Evaluate $\displaystyle\int \frac{x^2 + 1}{x^7}\, dx$.

3. Evaluate $\int x \cos(x^2 + 1) \, dx$

4. Evaluate $\int_{-11}^{11} x^{12} \sin(x) \, dx$.

5. Use the Fundamental Theorem of Calculus to find the derivative of a function $F(x) = \int_0^x \sin(t^{10}) \, dt$.

6. Express the Riemann sum with $n = 3$ terms and the left endpoint rule corresponding to $\int_1^2 \tan(x)\,dx$.

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

PART II

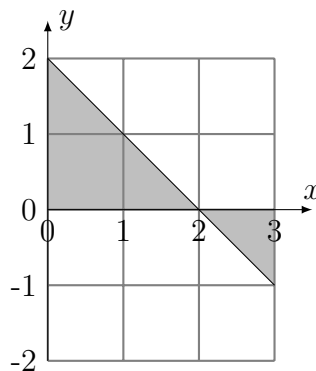1. **[14 points]** Evaluate $\displaystyle\int \frac{x}{(1+x)^{10}}\, dx$

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 $\frac{1}{2} \cdot$ base $\cdot$ height

3. [**14 points**] The velocity of a particle is given by $v(t) = t^2 - 3t$. The position of the particle at the time $t = 0$ is $S(0) = 0$.

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

   (b) Find the displacement of the particle on $[0, 4]$.

   (c) Find the total distance traveled by the particle on $[0, 4]$.

Scratch paper