**MA 125 CT, CALCULUS I**

Test 3, March 30, 2016

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 7 points each.**

1. Evaluate $\int_1^2 3x^2 + 2x\,dx$.

2. Evaluate $\int x(x^2 + 4)\,dx$.

3. Evaluate $\int x^2\sqrt{x^3+3}\,dx$.

4. The average value of the function $f(x) = 3x^2$ on the interval $[0, 2]$.

5. Evaluate $\int \dfrac{x^5+x^2}{x}\,dx$.

6. Estimate $\int_0^1 \cos(x^2)\,dx$ using a Riemann sum with $n = 3$ terms and the **midpoint rule**. [You do not need to simplify and compute a single number for your answer!]

7. Evaluate $\int_{-5}^{5} \dfrac{x}{x^4 + x^2 + 1}\,dx$.

8. Use the fundamental theorem of calculus to find the derivative of the function $y = g(x) = \int_1^x \cos(t^2)\,dt$.

## PART II

**All problems in Part II are 11 points each.**

1. Evaluate $\displaystyle\int \frac{x}{(1-x)^4}\,dx$.

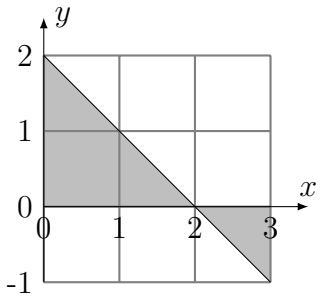
2. Evaluate $\displaystyle\int \frac{\cos(1/x)}{x^2}\,dx$.

3. 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) Is $g(x)$ increasing or decreasing on $(1, 2)$? [As always you must explain your answer!]

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




4. If the velocity of a particle is given by $v(t) = 3t^2 + 1$ and the position $S(0) = 3$ find a formula for the position $S(t)$ at time $t$. Also find the total distance traveled by the particle between times $t = 0$ and $t = 2$.

Scratch paper