MA 225 VT, HONORS CALCULUS I
Test 3, November 4, 2015

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 $\int_0^{\pi/4} \sec^2(x)\,dx$.

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

3. Evaluate $\int x^3 \sqrt[5]{x^4+3}\,dx$.

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

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

6. Estimate $\int_1^4 \sin(x^3)\,dx$ using a Riemann sum with $n = 3$ terms and the **midpoint rule**.

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

8. Use the fundamental theorem of calculus to write an expression for the antiderivative of the function $y = f(x) = \sin(x^3)$.

PART II

All problems in Part II are 11 points each.

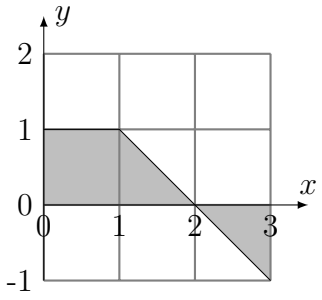
1. Evaluate $\displaystyle\int \frac{x}{(2x+1)^{30}}\,dx$.

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

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 $g(x) = \int_0^x f(t)\,dt$. 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 oil leaks out of a storage container at a rate of $(5t + 1)^{-2}$ $m^3/hour$ find the total amount which leaked from the container in the first 3 hours.

BONUS PROBLEM [5 points]

Find the anti-derivative of $f(x) = x^2 \sin(x)$