MA 125 CW, CALCULUS I

Test 3, November 9, 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 8 points each.

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

2. Evaluate $\int \dfrac{x^2+1}{x^5}\,dx$.

3. Evaluate $\int_0^1 x^3 \sin(2x^4 + 1)\, dx$

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

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

6. Use a Riemann sum with $n = 3$ terms and the midpoint rule to approximate the value of $\displaystyle\int_1^2 \frac{1}{x}\,dx$.

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

PART II

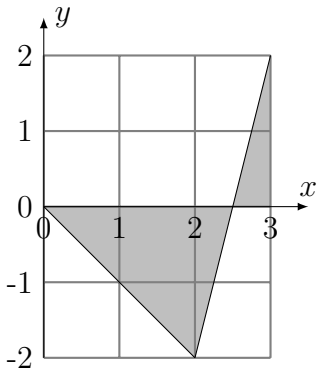
1. **[14 points]** Evaluate $\displaystyle\int \frac{(x+1)^2}{(1-x)^{30}}\,dx$

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 $v(t) = t^3 - t$ 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