Fall 2013

Exam #1

Math 202

Name: ______________________________

Write all of your responses on these exam pages. If you need more space please use the backs. Make sure that you show all of your work, answers without supporting work will receive no credit.

1. This exercise will be dealing with the function $f(x) = 2x^2 - 4x + 3$ on the interval $[1, 3]$.

   (a) (*10 Points*) Using 4 rectangles Find the right hand Riemann sum that approximates the area under the curve $f(x) = 2x^2 - 4x + 3$ over the interval $[1, 3]$. Your answer must either be in exact form or correct to all decimal places.

   (b) (*5 Points*) Using limit and summation notation, write an expression for the exact area under $f(x) = 2x^2 - 4x + 3$ and over the interval $[1, 3]$. Use the right-hand endpoints as the test values.

   (c) (*5 Points*) Using the limit and sum commands, write a Mathematica command that gives the exact area under $f(x) = 2x^2 - 4x + 3$ on $[1, 3]$.

(d) (*10 Points*) Using sum and limit rules, evaluate the limit that gives the exact area under $f(x) = 2x^2 - 4x + 3$ on $[1, 3]$. Recall the following summation formulas we went over in class.

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} \qquad \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} \qquad \sum_{i=1}^{n} i^3 = \left(\frac{n(n+1)}{2}\right)^2$$

2. (*10 Points Each*) Using your integral rules and the Fundamental Theorem of Calculus evaluate the following. Leave your answers in exact form, you do not need to simplify your solutions.

   (a) $\displaystyle\int \frac{x^5}{\sqrt[5]{1-3x^3}}\,dx$

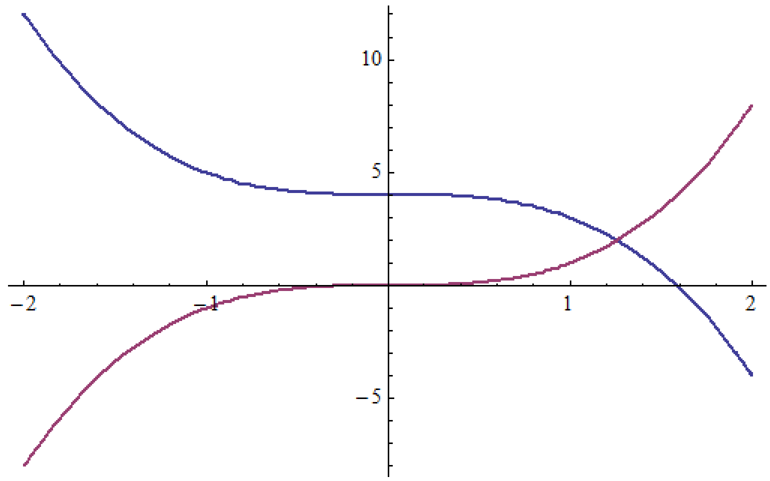
   (b) $\displaystyle\int \cot(x)\,dx$

(c) $\displaystyle\int \frac{3}{x} + \frac{x-2}{x^3} - 4(x+1)^2\,dx$

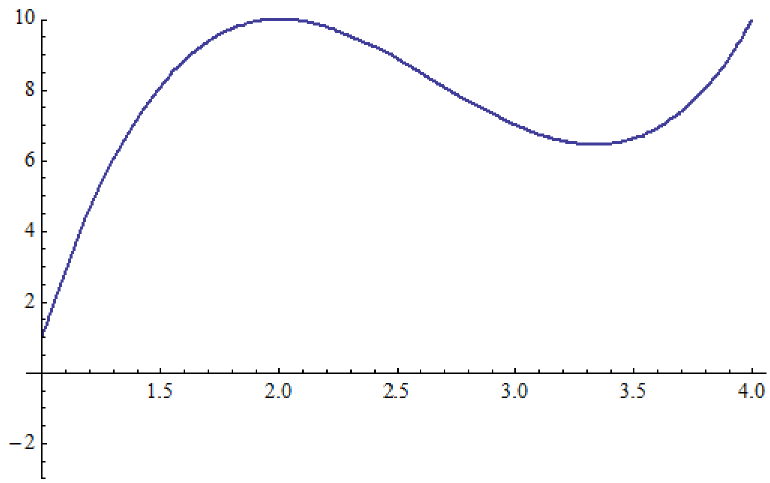
(d) $\displaystyle\int_3^5 x\sqrt{x^2-5}\,dx$

(e) $\displaystyle\frac{d}{dx}\left(\int_{x^3e^x}^{x^2} \sin\left(t^4\right)\,dt\right)$

3. (*10 Points*) Find the total area of the region bounded by the curves $y = 4 - x^3$ and $y = x^3$ over the interval $[-2, 2]$. Keep your answer in *exact* form.



4. (*10 Points*) Setup the integral that will find the volume of the solid obtained by revolving region bounded by the curve $f(x) = 3x^3 - 24x^2 + 60x - 38$, $y = 0$, $x = 1$ and $x = 4$ about the line $x = -2$. Do not evaluate the integral.



5. (*10 Points*) Setup the integral that will find the volume of the solid obtained by revolving region bounded by the curve $f(x) = 3x^3 - 24x^2 + 60x - 38$, $y = 0$, $x = 1$ and $x = 4$ about the line $y = -1$. Do not evaluate the integral.