Math 106 Midterm Exam #2 March 26, 2014

• This is a closed-book examination. No books, notes, calculators, cell phones, communication devices of any sort, webpages, or other aids are permitted.

• Simplify numerical answers such as $\sin\left(\frac{\pi}{6}\right)$ and $4^{\frac{3}{2}}$.

• Please *show* all of your work and *justify* all of your answers. (You may use the backs of pages for additional work space.)

1. [20 Points] Compute $\int_1^5 5 - 2x - x^2 \, dx$ using two different methods:

(a) Fundamental Theorem of Calculus

(b) Limit Definition of the Definite Integral.

2. [10 Points] Compute $g'(x)$ where $g(x) = \int_x^4 \frac{1 - \sin t}{t^2 + \tan t + \frac{9}{t}} \, dt$.

3. [25 Points] Evaluate each of the following integrals. Simplify.

(a) $\int_{-\frac{\pi}{3}}^{\frac{\pi}{2}} \sin\left(\frac{x}{2}\right) \, dx$

(b) $\int \frac{\sqrt{2}\ \sec^2(3x+4)}{\tan^2(3x+4)} \, dx$

(c) $\int_{\frac{\pi^2}{4}}^{\pi^2} \frac{\cos\sqrt{x}}{\sqrt{x}\ (1+\sin\sqrt{x}\ )^3} \, dx$

(d) $\int \frac{\cos x + \sin x}{\sqrt{\cos x - \sin x}} \, dx$

4. [25 Points] Evaluate each of the following integrals. Simplify.

(a) $\displaystyle\int \frac{x^{\frac{7}{4}} + x^{-\frac{1}{3}}}{\sqrt{x}}\, dx$

(b) $\displaystyle\int \frac{5}{x^2\left(5 + \frac{3}{x}\right)^{\frac{5}{3}}}\, dx$

(c) $\displaystyle\int_{-2}^{-1} \left(x - \frac{5}{x^3}\right)^2\, dx$

(d) $\displaystyle\int_{-3}^{-2} x\,(x+2)^7\, dx$

5. [20 Points] Consider an object travelling with velocity $v(t) = 3t - 9$ meters per second.

(a) Compute the **displacement** for the object from time $t = 1$ to $t = 4$.

(b) Compute the **total distance** travelled by the object from time $t = 1$ to $t = 4$.