Math 1552 **Exam 1** Fall 2017

Instructor: Sal Barone

Name: _____

GT username: _____

1. No books or notes are allowed.

2. No electronic devices are allowed.

3. Show all work and fully justify your answer to receive full credit.

4. Please BOX your answers.

5. The exam consists of 105 points but your score will be out of 100, there is a 5 pt. bonus question at the end.

6. Good luck!

Page	Max. Possible	Points
1	38	
2	15	
3	26	
4	26	
Total	105	

1. **(a)** If F is an antiderivative of f, then: $\hspace{3cm}$ (5 pts.)

$$\int f(g(x))g'(x)\, dx =$$

(b) Evaluate the integrals. $\hspace{4cm}$ (11 pts. each)

$$\int_{-1}^{2} |x - 1|\, dx$$

$$\int \frac{1}{\sqrt{9 - (1 - x)^2}}\, dx$$

$$\int \frac{x}{(ax^2 + b)^3}\, dx$$

2. The velocity of a particle is given by the formula $v(t) = 3t^2 + 6t - 2$, in meters per second. Evaluate the actual distance traveled between time $t = 1$ and $t = 2$ by taking a limit of Riemann sums using the general form of the definite integral. (15 pts.)

$$\int_a^b f(x) \, dx = \lim_{n \to \infty} \frac{b-a}{n} \sum_{i=1}^n f(x_i^*).$$

ANY OTHER METHOD WILL NOT RECEIVE FULL CREDIT.

3. Find the area bounded by the curves $y = x^3 + 3x^2$ and $y = x^2 - x$. (12 pts.)

4. Solve the initial value problem: (14 pts.)

$$\frac{dy}{dx} = \frac{x + xy^2}{1 + x^2}, \quad y(0) = \sqrt{3}.$$

5. (a) Calculate $\frac{d}{dx}\left(\int_{2x}^{\ln e} e^{t^2}\, dt\right)$. (10 pts.)

(b) On a walk around the block, you walk with a velocity of $v(t) = \frac{e^{2t}}{5+e^{2t}}$ feet per second. What was your average velocity for the first $\ln 5$ seconds of your walk? (11 pts.)

Bonus: *(a)* State the Fundamental Theorem of Calculus (Part I). (2 pts.)

(b) Draw a picture which illustrates the relationship between $\lim_{h\to 0}\frac{\int_x^{x+h} f(t)\, dt}{h}$ and $f(x)$, or explain in words or mathematically. (3 pts.)