Math 165 Final Exam Section: _____ Name: _____

Part A. Pencil and paper only.

This part of the exam has 10 problems on 5 pages. Each problem is worth 5 points. You may NOT use a calculator on this section. You must show all work. This part of the exam will be collected after 60 minutes.

1. Evaluate $\dfrac{d}{dx}\displaystyle\int_{x^2}^{1} \frac{t+1}{t^3+1}\,dt$.

2. Evaluate $\displaystyle\lim_{x\to 0} \frac{3^x - 1}{4^x - 1}$.

3. Evaluate $\displaystyle\int_0^1 \frac{10x+3}{5x^2+3x+2}\,dx$. Simplify your answer.

4. Find the Riemann sum for $\displaystyle\int_0^6 (x^2-1)\,dx$ that uses 3 equal subintervals and for each subinterval chooses c_k to be the right-hand endpoint. Simplify your answer.

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

6. Order the following functions from the slowest growing to the fastest growing as $x \to \infty$: e^x, $x \ln x$, and $\sqrt{x+4}$. Justify your argument.

7. Evaluate $\displaystyle\int_{-\sqrt{3}}^{1} \frac{12}{1+x^2}\,dx$. Simplify your answer.

8. Evaluate $\displaystyle\int x\sqrt{x+2}\,dx$.

9. Find the linearization $L(x)$ of the function $f(x) = \cos x$ at $\pi/6$.

10. Find the solution to the differential equation $dy/dx = 2xy^{1/3}$ that satisfies $y(0) = 8$. Write y explicitly in terms of x.