

Name: _____
TA's Name/Section #: _____
Recitation Day/Time: _____

Math 165: Final v.1

Part II

Spring 2013

This part of the exam has 8 problems; each problem is worth 10 points.

Answer each question completely. Show all work. No credit is allowed for mere answers with no work shown. Show the steps of calculations. State the reasons that justify any conclusions you make.

Question 1: _____

Question 2: _____

Question 3: _____

Question 4: _____

Question 5: _____

Question 6: _____

Question 7: _____

Question 8: _____

80 **Total Points:** _____

Question 1 (10 points). *A large building with a square base is to have an interior volume of 64000 cubic feet. Find the dimensions that give the minimum interior surface area of the building (including the ceiling and floor).*

Question 2 (10 points). *Solve the differential equation and find that solution for which $y = 3$ when $x = 9$.*

$$\frac{dy}{dx} = \frac{x - 5}{y^2}$$

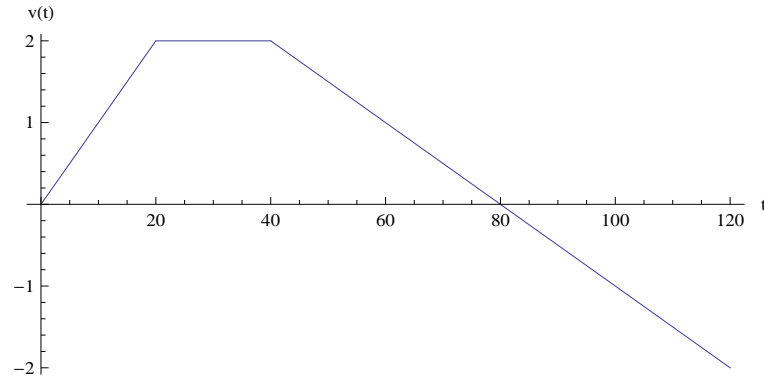
Find the area of the region under the curve $y = f(x)$ over the given interval. To do this, divide the interval into n equal subintervals, calculate the Riemann sum corresponding to such a partition and then let $n \rightarrow \infty$. You may need to use the following formula:

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

Question 3 (10 points).

$$f(x) = x^2 + 1 \text{ on } [0, 1]$$

Question 4 (10 points). *An object's velocity function is graphed. Assuming that the object is at the origin at $t = 0$, find its position at time $t = 100$ by using the appropriate area formulas from plane geometry.*



Question 5 (10 points). Let $F(x) = \int_{x^2}^1 \sqrt{t^3 + 4} dt$. Find $F'(x)$.

Question 6 (10 points). *Find the formula for f^{-1} , and find $f^{-1}(f(x))$:*

$$f(x) = \frac{3x + 2}{6x - 1}$$

Question 7 (10 points). *Find the derivative of the function $y = (\cos x)^{\sin x}$.*

Question 8 (10 points). *An $E. Coli$ cell divides into two cells every 20 minutes. If the initial population of cells is 100, when will the population reach 10,000 cells?*