

Name: \_\_\_\_\_

(100 points total)

1. (28 points) Let  $R$  be the region bounded by the curves  $y = 8x - 2x^2$  and  $y = 0$ . Give definite integrals which compute the volume of the solid obtained by revolving  $R$  about (a) the vertical line  $x = -2$  and (b) the horizontal line  $y = 10$ . **Do not evaluate either of these two integrals.**

2. (15 points) At the beginning of an experiment, a container holds 100 g of a radioactive substance. After 3 days, 74 g remains. How many days are required for the amount to be reduced to 37 g? Circle one:

(a) 6

(b) 12

(c)  $\frac{\ln 0.74}{3 \ln 0.37}$

(d)  $\frac{3 \ln 0.37}{\ln 0.74}$

(e)  $\frac{3 \ln 0.74}{\ln 0.37}$

3. (12 points) Consider the curve  $y = x^5 + x^2$ ,  $1 \leq x \leq 5$ . Give a definite integral which computes the surface area generated by rotating the curve about (a) the  $x$ -axis and (b) the  $y$ -axis. **Do not evaluate either of these two integrals.**

4. (15 points) Solve the initial value problem  $\frac{dy}{dx} = e^{3x+2y}$ ,  $y(0) = 5$ .

5. (15 points) Find the length of the curve  $x^2 = y^3$  from  $(0, 0)$  to  $(1, 1)$ .

6. (15 points) A cylindrical barrel of height 10 feet and radius 6 feet is half full of a liquid whose density is 40 pounds per cubic foot. Give a definite integral which computes the amount of work required to pump all of the liquid over the top of the barrel. **Do not evaluate the integral.**