MATH 114 – 13 JULY 2007 – EXAM 2

Answer each of the following questions. Show all work, as partial credit may be given.

1. (10 pts. each) Consider the surface generated by revolving the curve given by the graph of the function $y = x^{2/3}$ for $0 \leq x \leq 8$ about the x–axis.

(a) Set up an integral *with respect to the variable* x giving the area of the given surface. DO NOT EVALUATE.

(b) Set up an integral *with respect to the variable* y giving the area of the given surface. DO NOT EVALUATE.

2. (10 pts.) The population of a certain town on January 1 of a given year is 50000. Let $y(t)$ be the population of the town t years later. Suppose that 2 years later the population is 62500. Assuming that the population of the town is growing exponentially, find the value of y_0 and k in the population model $y(t) = y_0\, e^{kt}$.

3. (10 pts. each) Use substitution and/or simplification to compute the following integrals. Be sure to show all work.

(a) $\displaystyle\int_0^1 x\,(x+1)^{1/2}\,dx$

(b) $\displaystyle\int \frac{\cos(\sqrt{x})}{\sqrt{x}}\,dx$

4. (10 pts. each) Use integration by parts to compute the following integrals. Be sure to show all work.

(a) $\displaystyle\int_1^4 x^2\,\ln(x)\,dx$

(b) $\displaystyle\int \theta^2\,\sin(2\theta)\,d\theta$

5. (10 pts. each)

(a) Expand the rational function $\dfrac{x+1}{x(x^2+1)}$ by partial fractions. Be sure to show all work.

(b) Express the integrand of $\displaystyle\int \frac{y+4}{y(y+1)}\,dy$ as a sum of partial fractions and evaluate the integral. Be sure to show all work.

6. (10 pts.) Evaluate the integral $\displaystyle\int_0^{\pi/2} \sin^4(x)\,\cos^3(x)\,dx$. Be sure to show all work.