MATH 114 – 30 MAY 2008 – EXAM 2

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

1. (10 pts.) Set up but DO NOT EVALUATE an integral giving the area of the surface generated by revolving the curve $y = \sqrt{x}$, $3/4 \leq x \leq 4$ about the x–axis.

2. (10 pts.) Suppose that a population of bacteria grows exponentially. Suppose that at the end of 3 hours there are $5,000$ bacteria and at the end of 5 hours there are $15,000$. What will be population be after 9 hours? Be sure to show all work.

3. (10 pts. each) Evaluate the following integrals using substitution.

(a) $\displaystyle\int x\sqrt{x^2-1}\,dx$

(b) $\displaystyle\int_0^{\pi/4} \sec^2(x)\,\tan^2(x)\,dx$

4. (10 pts. each) Use integration by parts to compute each of the following integrals.

(a) $\displaystyle\int_0^{\pi} x\,\sin(x)\,dx$

(b) $\displaystyle\int x^3\,\ln(x)\,dx$

5. (10 pts. each)

(a) Expand the quotient $\dfrac{2x-3}{x(x+1)^2}$ by partial fractions.

(b) Compute the integral $\displaystyle\int_1^2 \frac{2x-3}{x(x+1)^2}\,dx$.

6. (10 pts. each) Compute each of the following trigonometric integrals.

(a) $\displaystyle\int \sin^3(x)\,\cos^2(x)\,dx$

(b) $\displaystyle\int_0^{\pi} \tan^2(x)\,dx$

$$\sin^2(x) = \frac{1}{2} - \frac{1}{2}\cos(2x),\ \ \cos^2(x) = \frac{1}{2} + \frac{1}{2}\cos(2x),\ \ \sin^2(x) + \cos^2(x) = 1,\ \ \tan^2(x) = \sec^2(x) - 1$$