Review 2 Spring 1990

1. Find the following integrals

   a) $\int \sin^3\theta \cos^4\theta \; d\theta$ b) $\int x \sec^2 5x \; dx$ c) $\int \frac{x+4}{x^3+x} \; dx$ d) $\int \frac{dx}{\sqrt{7-x^2+6x}}$

   e) $\int \sin^4 x \; dx$ f) $\int \frac{\sqrt{5x^2-1}}{x} \; dx$ g) $\int \frac{\ln x}{x^2} \; dx$ h) $\int \frac{x^3+2}{x^2-1} \; dx$

   i) $\int x \tan^{-1} x \; dx$ j) $\int \cos^3 x \sin 2x \; dx$ k) $\int \sec^4 x \tan^4 x \; dx$ l) $\int \frac{x^3 dx}{\sqrt{25+x^2}}$

2. a) Use Simpson's Rule with $n = 4$ to write a sum which approximates the integral $\int_0^1 \sqrt{1-x^2} \; dx$. [Leave your answer as a sum of terms. Don't perform the calculation.]

   b) What is the exact value of the integral? [Answer this in the easiest way possible.]

3. Sketch the graph of the polar curve $r^2 = 9\cos 2\theta$. Identify the curve.

4. Convert to rectangular coordinates and then sketch the following curves:

   a) $r = 2\sin\theta$ b) $2r = \sec\theta$ c) $r = \frac{2}{1-\cos\theta}$

5. Consider the curve given by the parametric equations
   $x = 1 - \cos t$
   $y = t - \sin t \qquad 0 \le t \le 2\pi$

   a) Find the equation of the tangent line to the curve at the point where $t = \frac{\pi}{2}$.

   b) Find $\frac{d^2y}{dx^2}$ in terms of t.

   c) Set up, but do not evaluate, the integral for the arc length of the curve.

6. Sketch and identify the curve with parametric equations $x = 3e^{-t}, \quad y = 5e^{-t}$. Indicate the direction of increasing t.