Math 114 **Review for Final** **Fall 2002**

Here is a list of sample problems. You should still go through homework problems. I make NO claims that this list is exhaustive!

1. Let R be the region in the first quadrant bounded by the curves $y = x^3$ and $y = 2x - x^2$. Calculate:

   (a) The area of R.

   (b) The volume obtained by rotating R about the x-axis.

   (c) The volume obtained by rotating R about the y-axis.

2. The base of a solid is the region bounded by the parabolas $y = x^2$ and $y = 2 - x^2$. Find the volume of the solid if the cross-sections perpendicular to the x-axis are squares with one side lying along the base.

3. Calculate the following integrals (if they converge).

   a) $\int x^3 \ln x dx$ b) $\int \frac{\sqrt{x-2}}{x+2} dx$ c) $\int \frac{x}{\sqrt{1-x^2}} dx$

   d) $\int e^{3x} \cos x dx$ e) $\int \frac{x+2}{x^2-x-2} dx$ f) $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

   g) $\int \frac{1}{x^2-4} dx$ h) $\int \sqrt{1-4x^2} dx$ i) $\int \frac{x}{\sqrt{1-x^2}} dx$

   j) $\int \tan^3 x dx$ k) $\int \sin^2 x dx$ l) $\int \frac{x-1}{x+1} dx$

   m) $\int_{-1}^{4} \frac{1}{\sqrt[3]{x}} dx$ n) $\int_{-\infty}^{\infty} \arctan x dx$ o) $\frac{1}{x^2\sqrt{1+x^2}} dx$

   p) $\int_{-\infty}^{\infty} \frac{1}{1+x^2} dx$ q) $\int \frac{\ln(\ln x)}{x}$

4. (a) Give the Taylor polynomial T_3 for $f(x) = \sqrt{1+x}$ at $x = 0$.

   (b) How large can the remainder term $|R_3(x)|$ be over the interval $[0, 3]$?

5. a) Express $(x, y) = (-1, \sqrt{3})$ in polar coordinates.
   b) Express the polar equation $r = 2\sin\theta$ in cartesian coordinates.
   c) Graph the polar equation $r = 1 + 2\sin\theta$.

6. Let $f(x) = 1 - t^2$ and $y = t^2 - 4t$.
   (a) Identify any horizontal/vertical tangent lines.
   (b) Find where $\dfrac{dx}{dt}$ and $\dfrac{dy}{dt}$ are positive/negative.
   (c) Graph the curve.

7. Arc Length

8. Sequences

9. Series

10. Taylor series

11. a) Give a power series representation of $\dfrac{1}{1+x}$.
    b) Obtain a power series representation for $\ln(1+x)$ from part a).
    c) Find the radius and interval of convergence of the series in b).

12. Find the radius and interval of convergence for $\displaystyle\sum_{n=1}^{\infty} \frac{x^n}{3^n} n^3$

13. Give the Maclaurin series for e^{3x}.

14. Write $-3/2 + 3/2i$ in polar form.

15. Compute $(-3/2 + 3/2i)^6$

16. Find all solutions to $x^5 + 32 = 0$. Leave your answers in polar form.