Calculus II   Midterm Practice problems

Chap 4: Sec. 4.10.

1. Evaluate the given integral

   (a) $\int_{-\infty}^{\infty} \frac{e^{-x}}{(1+e^{-x})^2}\, dx$

   (b) $\int_{-\infty}^{\infty} x^3\, dx$

   (c) $\lim_{R\to\infty} \int_{-R}^{R} x^3\, dx$

2. Determine whether the integral converges or diverges:

   (a) $\int_0^1 x^{-1/3}\, dx$

   (b) $\int_0^1 x^{-4/3}\, dx$

   (c) $\int_1^{\infty} x^{-1/3}\, dx$

   (d) $\int_{-1}^1 x^{-1/3}\, dx$

Chap 5: Sec. 5.3-Sec. 5.4.

1. Set up a definite integral for the arc length of an ellipse $x^2 + 4y^2 = 4$.

2. Set up the integral for the surface area of the surface of revolution. $y = e^x, 0 \le x \le 1$, revolved about x-axis.

3. (i) At time t, a particle has position $x(t) = 1 - \cos t,\quad y(t) = t - \sin t$ Find the total distance traveled from $t = 0$ to $t = 2\pi$. Find the speed of the particle at $t = \pi$.
   (ii) Find the area of the surface generated by revolving the curve $y = \cosh x$, $x \in [0, \ln 2]$ about the x-axis.

Chap 6: Sec. 6.1-Sec. 6.3.

1. Two years ago, there were 4 grams of a radioactive substance . Now there are 3 grams. How much was there 10 years ago?

2. Find the size of permanent endowment needed to generate an annual \$2,000 forever at 10% (annual) interest compounded continuously.

3. Solve the IVP, explicitly, if possible $y' = \frac{x-1}{y^2}, y(0) = 2$.

- Sec. 7.1:
  Find the limit of a sequence. Determine the convergence of a sequence.
    Examples:2-12.   Practice Problems:11,31,43,53,65.

- Sec. 7.2:
  Convergence and divergence of a series; geometric series; p-series; k-th term test for divergence.
    ExamplesExamples: 1-7.   Practice Problems:1, 7, 17, 37, 39, 41.

- Sec. 7.3:
  Integral Test; Comparison Test; Limit Comparison Test.
    Examples: 1-2,5-9.   Practice Problems:1, 11, 37, 41, 45, 57.

- Sec. 7.4:
  Alternating Series Test;
    Examples: 1-4.   Practice Problems:1, 11, 41, 43.

- Sec. 7.5:
  Absolute Convergence and Conditional Convergence; Ratio Test.
    Examples: 1-7.   Practice Problems: 7, 13, 25, 35, (40).

- Sec. 7.6:

  Interval and Radius of Convergence; Term-by-term differentiation and integration.

  Examples: 1-6.   Practice Problems: 1, 3, 11, 21, 39.

- Sec. 7.7:

  Taylor's Theorem; Derive a Taylor series or polynomial; Find new Taylor series from old ones.

  Examples: 1-3,8.   Practice Problems: 1, 5, 33, 41, (47).

- Sec. 7.8:

  Use Taylor polynomials to approximate a function, to find the limit and to approximate an integral.

  Examples: 1-5.   Practice Problems: 7, 11, 13, 15.