1. Integrals

(a) Compute the area that lies between the curves $y = x^3 - x^2 + 1$ and $y = 1$.
(b) $\int_0^1 x^3 + x^{1/3} \, dx$
(c) $\int_0^\pi (1 + \cos (x)) \, dx$
(d) $\int e^x \cos e^x \, dx$
(e) $\int e^x \cos x \, dx$
(f) $\int x^2 e^x \, dx$
(g) $\int_{-\pi/2}^{\pi/2} \frac{\cos t}{(1 - \sin t)^2} \, dt$
(h) $\int_0^{\pi/4} \sin^3 2x \, dx$
(i) $\int \cos x (\sin^3 x + 2 \sin^2 x - 4 \sin x) \, dx$
(j) $\int \sin^2 x \, dx$
(k) $\int x \ln (x) \, dx$
(l) $\int x^2 e^{3x} \, dx$
(m) $\int \arctan x \, dx$
(n) $\int (x^2 + 25)^{1/2} \, dx$
(o) $\int (x^2 - 25)^{1/2} \, dx$
(p) $\int (25 - x^2)^{1/2} \, dx$
(q) $\int \frac{1}{\sqrt{x^2 + 25}} \, dx$
(r) $\int \frac{1}{(x+1)(x-1)^2} \, dx$
(s) $\int \frac{1}{(x+1)(x-1)} \, dx$
(t) $\int \frac{1}{(x^2+1)(x-1)} \, dx$
(u) $\int_0^1 \frac{dx}{\sqrt{x}}$
(v) $\int_0^\infty 2xe^{-x^2} \, dx$
(w) $\int_1^\infty \frac{1}{(x^3+1)} \, dx$
(x) $\int_0^\infty \frac{1}{(x^3+1)} \, dx$

2. For volumes pay attention to
   - Section 6.1, p. 362 # 15,17,18,21;
   - Section 6.2 p. 369 # 1,8,29;

3. For Arc-length and surface area pay attention to
   - Section 6.3, p. 376 # 3,5,9;
   - Section 6.4, p. 381 # 9;
• The arc length of a sector of a circle;
• The surface area of a slice of a sphere;

4. For other applications pay attention to
   • (Work) Section 6.5, p. 386 # 1,4,5,7,8;
   • (centers of mass) Section 6.6, p. 397 # 1, 15, 17.

5. For each of the recursively defined sequences, write out the first 5 terms. When possible, give a closed formula for the general term, and determine if the sequence converges.
   (a) \(a_1 = 1, \ a_{n+1} = a_n + (1/2^n)\).
   (b) \(a_1 = 1, \ a_{n+1} = a_n/(n+1)\).
   (c) \(a_1 = 2, \ a_{n+1} = (-1)^{n+1}a_n/2\).
   (d) \(a_1 = 1, \ a_{n+1} = 1/(1 + a_n)\).

6. Determine the limits as \(n \to \infty\) of each sequence:
   (a) \(a_n = 2 + (0.1)^n\)
   (b) \(a_n = \frac{n+3}{n^2+5n+6}\)
   (c) \(a_n = (-\frac{1}{2})^n\)
   (d) \(a_n = \frac{\sin n}{n}\)

7. For each of the series determine a formula for the \(n\)th partial sum:
   (a) \[
   \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \cdots + \frac{1}{(n+1) \cdot (n+2)} + \cdots
   \]
   (b) \[
   1 + \frac{1}{5} + \frac{1}{25} + \cdots + \frac{1}{5^n} + \cdots
   \]
   (c) \[
   \frac{9}{10} + \frac{9}{100} + \cdots + \frac{9}{10^n} + \cdots
   \]
   (d) \[
   \left(-\frac{2}{3}\right)^2 + \left(-\frac{2}{3}\right)^3 + \left(-\frac{2}{3}\right)^4 + \cdots
   \]

8. Use any test that you like to determine if the given series converges.
   (a) \[
   \sum_{n=2}^\infty \frac{\ln n}{\sqrt{n}}
   \]
(b) \[ \sum_{n=1}^{\infty} \frac{1}{n^{100,001/100,000}} \]

(c) \[ \sum_{n=1}^{\infty} \frac{n}{n^2 + 1} \]

(d) \[ \sum_{n=1}^{\infty} \frac{1}{3^n - 1} \]

(e) \[ \sum_{n=1}^{\infty} \frac{\sqrt{n}}{n^2 + 3} \]

(f) \[ \sum_{n=1}^{\infty} \frac{1}{n!} \]

(g) \[ \sum_{n=1}^{\infty} \left(1 + \frac{3}{n}\right)^n \]

(h) \[ \sum_{n=1}^{\infty} \frac{n!}{(2n)!} \]

(i) \[ \sum_{n=1}^{\infty} \frac{1}{n^{2/3}} \]

(j) \[ \sum_{n=2}^{\infty} \frac{1}{n\sqrt{n^2 - 1}} \]

9. For power series pay particular attention to section 9.7, page 536 problems # 1,2,5,7,9,12,23,35 and review problems page 560 # 41,42,45,48.

10. For Taylor/MacLauren series, observe that the problems page 560 # 57-64 are all obtained by substitution methods. Be able to derive these series by substitution. Also be able to obtain the series in table 9.1 page 556 by differentiation and using the expression \[ \sum_{n=0}^{\infty} \frac{f^{(n)}(0)}{n!} x^n. \]

11. page 568, section 10.1 # 19-22

12. Section 10.3 #25-29
13. areas of polar graphs (and the graphs of the functions) such as

(a) \( r = 1 + \cos (\theta) \)

(b) one petal of \( r = \cos (3\theta) \)