1. Integrate the following

a) $\int \frac{3x+8}{x^2+4x+4} \, dx$

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

c) $\int \tan^5(2x)\sec^3(2x) \; dx$

d) $\int \frac{\sqrt{x^2-25}}{x} \, dx$

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

f) $\int_1^5 3x\sqrt{x-1}\,dx$

2. Find each limit if it exists.

a) $\lim\limits_{x \to 2} \dfrac{x^3 - 4x^2 + 4x}{3x^2 - 12x + 12}$

b) $\lim\limits_{x \to 0^+} (2x)^{\sin(x)}$

3. Evaluate each improper integral if it converges, otherwise clearly state that it diverges.

a) $\int_{-\infty}^{0} 2 \tan^{-1}(3x)\ dx$

b) $\int_{0}^{1} \frac{4}{3x^3}\ dx$

4. State whether the following converge conditionally, converge absolutely or diverge. Show all work and state the names of all tests used.

a) $\sum_{k=2}^{\infty} \frac{7}{k \ln(k)}$

b) $\sum_{n=0}^{\infty} \left(\frac{1}{4}\right)^{n-\sqrt{n}}$

c) $\sum_{n=1}^{\infty} \frac{(-5)^n 2n!}{(2n)!}$

d) $\sum_{k=1}^{\infty} \frac{(-1)^k}{11k+20}$

5. Find the interval and radius of convergence for the given power series. Be sure to check the endpoints.

$$\sum_{n=1}^{\infty} \frac{(-4)^n (2x-8)^n}{\sqrt{3n+1}}$$

6. Determine the McLaurin series for the following. Give your answer in summation notation.

a) $f(x) = 4x^2 (\sin(8x^3))$

b) $g(x) = \dfrac{e^{x^2}}{2x^3}$

7. Find the Taylor polynomial of order four for $F(x) = \sin(2x)$ where $a = -\pi/12$.
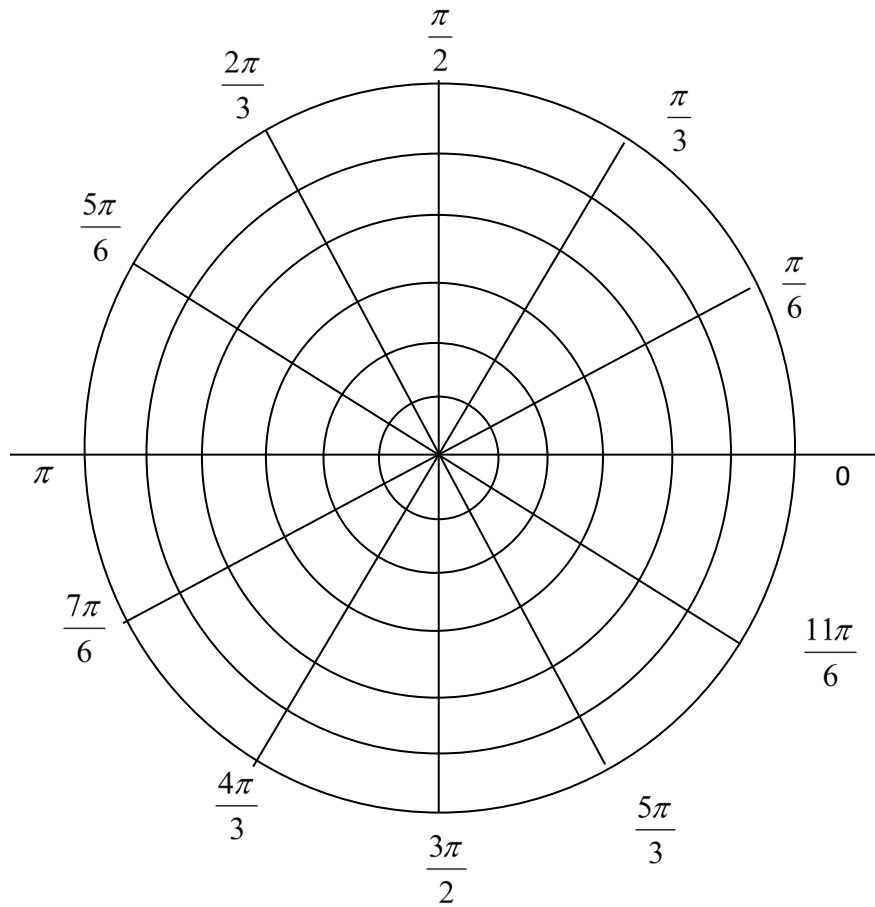
8. Evaluate the following integral to the nearest ten-thousandth. Use the appropriate number of terms in your evaluation.

$$\int_0^{0.77} e^{-x^2}\, dx$$

9. Find the equation of the line which is tangent to the given parametric equation where t = 0.   Give your answer in slope –intercept form.

$$X(t) = e^{3t} - \sin(t) +3 \qquad Y(t) = e^{-2t} + 4t + 1$$

10.   a. Graph the polar equation r = 4sin(2θ).

b. Find the area enclosed in this curve.

c. Set up only the integral which represents the arc length of one leaf of this curve.

11. Find the length of the parametric curve from t =0 to t =2 for

$$X(t) = e^{3t} + e^{-3t} + 2 \quad \text{and} \quad Y(t) = 5 - 6t$$

12. Eliminate the parameter and sketch the parametric equation given. Be sure to indicate the direction of travel.

$$X(t) = 2 + 4 \sin t \qquad Y(t) = 2 \cos t + 3 \quad \text{where } 0 \le t \le 2\pi \, .$$