BC Calculus –Review Sheet

When you see the words ….	This is what you think of doing…
1. Find the area of the unbounded region represented by the integral $\int_{1}^{\infty} f(x)dx$ (sometimes called a horizontal improper integral).	
2. Find the area of a different unbounded region under f(x) from (a,b], where $\lim_{x \to a^+} f(x) = \infty \text{ or } -\infty$, where the area is represented by $\int_{a}^{b} f(x)dx$,(sometimes called a vertical improper)	
3. Given a f(x), find arc length of the function on the interval (a, f(a)) and (b,f(b)).	
4. Given a curve in parametric form where $x = f(t), y = g(t)$, find the arc length of the curve on the interval $[t_1, t_2]$.	
5. Given $\frac{dy}{dx} = F(x,y) = xy$ and an initial point $(x_o, y_o) = (1,1)$, find an approximate value for $f(1.2)$ and $\Delta x = 0.1$	
6. Given the differential equation of the form $\frac{dP}{dt} = kP\left(1 - \frac{P}{L}\right)$ for P as a function of t, where k and L are constants.	

7. Given the differential equation $\frac{dP}{dt} = 12P - 4P^2$ where P is measuring the number an animal present on day 0. Find the value of P when the number of these animals is increasing the fastest.	
8. Given the differential equation $\frac{dP}{dt} = 1200P - 400P^2$ where P is measuring the number an animal present on day 0. Determine the $\lim_{n\to\infty} P(t)$.	
9. Given that a line segment has endpoints of (1,2) and (5,10), write a set of parametric equations for the line that passes through these two points.	
10. Given the position function of two particles in parametric form, $x_1(t) = f(t), y_1(t) = g(t)$ and $x_2(t) = h(t), y_2(t) = k(t)$, determine if the particles intersect or collide.	
11. Given a set of parametric equations where $x = f(t), y = g(t)$, find $\frac{dy}{dx}$ or the slope of the tangent line.	

12. A path of a particle is described with a set of parametric equations $x = f(t), y = g(t)$. Find the equation of the tangent line when t = to .	
13. A path of a particle is described with a set of parametric equations $x = f(t), y = g(t)$. a. Find all values of t where the particle's path is vertical. b. Find all values of t where the particle's path is horizontal.	
14. Given a set of parametric equations where $x = f(t), y = g(t)$, find $\frac{d^2y}{dx^2}$	
15. Given the position vector of a particle moving in the plane is $r(t) = \langle x(t), y(t) \rangle$. Find the velocity vector.	
16. The position vector of a particle moving in the plane is $r(t) = \langle x(t), y(t) \rangle$. Find the acceleration vector.	
17. The position vector of a particle moving in the plane is $r(t) = \langle x(t), y(t) \rangle$. Find the speed of the particle at a moment at time t = a.	
18. Given the velocity vector $v(t) = \langle x'(t), y'(t) \rangle$ and position vector at t = 0 as $\langle x(0), y(0) \rangle$, find the position vector at time t = a.	

19. Given $v(t) = \langle x'(t), y'(t) \rangle$ determine when the particle is stopped.	
20. Given $v(t) = \langle x'(t), y'(t) \rangle$ find the slope of the tangent line to the vector at t_1.	
21. Given a particle moves along a function $y = 3x^2+1$, the rate of change of x or $\frac{dx}{dt} = 3t$ for $t>0$ and $x(0)=1$. Find the particle's position at time $t = 3$.	
22. Find the slope of the tangent line to the polar curve $r = f(\theta)$.	
23. Given a polar curve $r = f(\theta)$, find horizontal tangents to curve.	
24. Find vertical tangents to a polar curve $r = f(\theta)$.	
25. Find the area inside one of the petals on the flower described by $r = 2\cos(3\theta)$.	

26. Find the area outside $r_1(\theta)$ but inside $r_2(\theta)$.	
27. Find the arc length of a function $r_1(\theta)$ from $\theta = a \ and \ \theta = b$.	
28. Find the sum $\frac{3}{2} + \frac{1}{2} + \frac{1}{6} + \frac{1}{216} + \cdots$.	
29. Determine if the series $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \cdots + \frac{n}{n+1} + \cdots$ converges or diverges	
30. Determine if the series $\sum_{n=1}^{\infty} \frac{3}{n+1}$ converges or diverges	

31. Determine if the series $\sum_{n=1}^{\infty} \frac{1}{x^{\frac{3}{2}}}$ converges or diverges.	
32. Determine if the series $\sum_{n=1}^{\infty} \frac{1+\sin x}{x^2}$ converges or diverges.	
33. Determine if the series $\sum_{n=1}^{\infty} \frac{3^n}{4^n+1}$ converges or diverges.	
34. Determine if the series $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{n}$ converges or diverges.	
35. Write a series for $x \cos x$ where *n* is an integer	
36. Write a series for $\ln(1+3x)$ centered at x = 0.	

37. If $f(x) = 2 + x + \frac{1}{2}x^2 + \frac{1}{4}x^3 + \ldots$ represents a T Taylor Polynomials about x = 0, find $f(-2)$	
38. Write the nth degree Taylor Polynomial for f(x) at x = c.	
39. Given a Taylor series, find the Lagrange form of the remainder for the 4th term.	
40 Let S_4 be the sum of the first 4 terms of an alternating series for f(x). Approximate $\left\| f(x) - S_4 \right\|$.	
41. Given the polynomials $f(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots$, what is f(x)?	
42. Given the polynomial $f(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots + \frac{(-1)^n x^{2n+1}}{(2n+1)!} + \ldots$, what is f(x)?	
43. Given the polynomial $f(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots + \frac{(-1)^n x^{2n}}{(2n)!} + \ldots$, what is f(x)?	

44. Find the interval of convergence of a series.	
45. Find $\lim_{x \to a} \frac{f(x)}{g(x)}$	
46. Find $\int \frac{dx}{x^2 + x - 12}$	