

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 $\lim_{x \rightarrow a^+} f(x) = \infty$ 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 $(x_0, y_0) = (1, 1)$ , 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.	

<p>7. Given the differential equation <math>\frac{dP}{dt} = 12P - 4P^2</math> 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.</p>	
<p>8. Given the differential equation <math>\frac{dP}{dt} = 1200P - 400P^2</math> where P is measuring the number an animal present on day 0. Determine the <math>\lim_{t \rightarrow \infty} P(t)</math>.</p>	
<p>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.</p>	
<p>10. Given the position function of two particles in parametric form, <math>x_1(t) = f(t)</math>, <math>y_1(t) = g(t)</math> and <math>x_2(t) = h(t)</math>, <math>y_2(t) = k(t)</math>, determine if the particles intersect or collide.</p>	
<p>11. Given a set of parametric equations where <math>x = f(t)</math>, <math>y = g(t)</math>, find <math>\frac{dy}{dx}</math> or the slope of the tangent line.</p>	

<p>12. A path of a particle is described with a set of parametric equations <math>x = f(t), y = g(t)</math>. Find the equation of the tangent line when <math>t = t_0</math>.</p>	
<p>13. A path of a particle is described with a set of parametric equations <math>x = f(t), y = g(t)</math>.</p> <p>a. Find all values of <math>t</math> where the particle's path is vertical.</p> <p>b. Find all values of <math>t</math> where the particle's path is horizontal.</p>	
<p>14. Given a set of parametric equations where <math>x = f(t), y = g(t)</math>, find <math>\frac{d^2y}{dx^2}</math></p>	
<p>15. Given the position vector of a particle moving in the plane is <math>r(t) = \langle x(t), y(t) \rangle</math>. Find the velocity vector.</p>	
<p>16. The position vector of a particle moving in the plane is <math>r(t) = \langle x(t), y(t) \rangle</math>. Find the acceleration vector.</p>	
<p>17. The position vector of a particle moving in the plane is <math>r(t) = \langle x(t), y(t) \rangle</math>. Find the speed of the particle at a moment at time <math>t = a</math>.</p>	
<p>18. Given the velocity vector <math>v(t) = \langle x'(t), y'(t) \rangle</math> and position vector at <math>t = 0</math> as <math>\langle x(0), y(0) \rangle</math>, find the position vector at time <math>t = a</math>.</p>	

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

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

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

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

44. Find the interval of convergence of a series.

45. Find  $\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$

46. Find  $\int \frac{dx}{x^2 + x - 12}$



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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).	Set up $\lim_{b \rightarrow \infty} \int_1^b f(x) dx$ to see if the area diverges or converges.
2. Find the area of a different unbounded region under $f(x)$ from $(a,b]$ , where $\lim_{x \rightarrow a^+} f(x) = \infty$ or $-\infty$ , where the area is represented by $\int_a^b f(x)dx$ , (sometimes called a vertical improper)	Set up $\lim_{x \rightarrow a^+} \int_a^b f(x) dx$ to see if the area diverges or converges.
3. Given a $f(x)$ , find arc length of the function on the interval $(a, f(a))$ and $(b,f(b))$ .	Use the integral: $L = \int_a^b \sqrt{1 + [f'(x)]^2} dx$ .
4. Given a curve in parametric form where $x = f(t)$ , $y = g(t)$ , find the arc length of the curve on the interval $[t_1, t_2]$ .	Use the integral: $L = \int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$
5. Given $\frac{dy}{dx} = F(x, y) = xy$ and an initial point $(x_0, y_0) = (1, 1)$ , find an approximate value for $f(1.2)$ and $\Delta x = 0.1$	Think about Euler's Method to draw tangent lines and approximate along the tangent lines. First calculate the slope at $(1, 1)$ and write an equation of a tangent line to $f$ at $(1, 1)$ . Use this line to approximate a new point at $x=1.1$ using $\Delta x = 0.1$ . This gives you a second point to repeat the procedure again. Write another tangent line with a new slope and approximate the value of $f(1.2)$ by moving along this second tangent line to the point $x = 1.2$ .
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.	Separate the differentials, use partial fractions, integrate, use an initial condition to solve for the constant and end up with an equation of the form: $P = \frac{L}{1 + Ae^{-Mkt}}$

<p>7. Given the differential equation <math>\frac{dP}{dt} = 12P - 4P^2</math> 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.</p>	<p>7. First notice that <math>\frac{dP}{dt} = 12P - 4P^2</math> is a parabola, so rewriting it in the form <math>\frac{dP}{dt} = kP\left(1 - \frac{P}{L}\right)</math> or <math>\frac{dP}{dt} = 12P\left(1 - \frac{P}{3}\right)</math> tells us that the <math>\frac{dP}{dt} = 0</math> v when <math>P=0</math> or <math>P=3</math>. The number of animals is increasing fastest at the midpoint of 0 and 3 or 1.5.</p>
<p>8. Given the differential equation <math>\frac{dP}{dt} = 1200P - 400P^2</math> where P is measuring the number an animal present on day 0. Determine the <math>\lim_{n \rightarrow \infty} P(t)</math>.</p>	<p>Factoring <math>\frac{dP}{dt} = 1200P - 4P^2 = 1200P\left(1 - \frac{P}{300}\right)</math> we can see that <math>\frac{dP}{dt} = 0</math> when <math>P=0</math> and <math>P=300</math>. Therefore, <math>P=300</math> is the <math>\lim_{n \rightarrow \infty} P(t)</math> since the grow increases between <math>P = 0</math> and <math>P = 300</math> but stops at <math>P = 300</math>.</p>
<p>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.</p>	<p>Determine the slope (m) of the line segment (<math>m=2</math>), write an equation for the line segment using point slope form (<math>y=2(x-1)+2</math>), and then rewrite this equation as parametric equations where <math>x(t)=t</math> and <math>y(t)=2(t-1)+2</math> or <math>y(t)=2t</math>. Select values for t from knowing that x or t starts at 1 and goes to 5 so <math>1 \leq t \leq 5</math></p>
<p>10. Given the position function of two particles in parametric form, <math>x_1(t) = f(t)</math>, <math>y_1(t) = g(t)</math> and <math>x_2(t) = h(t)</math>, <math>y_2(t) = k(t)</math>, determine if the particles intersect or collide.</p>	<p>For the paths to intersect <math>x_1(t_1) = x_2(t_2)</math> and <math>y_1(t_1) = y_2(t_2)</math>. Solve these equations simultaneously to find the time when the paths intersect. For the particles to collide they must be at a point at the same time. Determine the times when each particle is at the given point. If the times match, the particles collide, otherwise their paths only cross.</p>
<p>11. Given a set of parametric equations where <math>x = f(t)</math>, <math>y = g(t)</math>, find <math>\frac{dy}{dx}</math> or the slope of the tangent line.</p>	<p>Recall that <math>\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}</math></p>

<p>12. A path of a particle is described with a set of parametric equations <math>x = f(t), y = g(t)</math>. Find the equation of the tangent line when <math>t = t_0</math>.</p>	<p>Determine the point where the particle is <math>(x(t_0), y(t_0))</math>. Then find the slope of the graph at the time <math>t = t_0</math> by calculating <math>\left. \frac{dy}{dx} = \frac{dy/dt}{dx/dt} \right _{t=t_0}</math>. Then write the equation of the line in point-slope form.</p>
<p>13. A path of a particle is described with a set of parametric equations <math>x = f(t), y = g(t)</math>.</p> <p>a. Find all values of <math>t</math> where the particle's path is vertical.</p> <p>b. Find all values of <math>t</math> where the particle's path is horizontal.</p>	<p>a. Determine the times when <math>\frac{dx}{dt} = 0</math> and <math>\frac{dy}{dt} \neq 0</math>.</p> <p>b. Determine the times when <math>\frac{dy}{dt} = 0</math> and <math>\frac{dx}{dt} \neq 0</math>.</p>
<p>14. Given a set of parametric equations where <math>x = f(t), y = g(t)</math>, find <math>\frac{d^2y}{dx^2}</math></p>	<p>First find <math>\frac{dy}{dx} = \frac{dy/dt}{dx/dt}</math> then calculate <math>\frac{d}{dx} \left[ \frac{dy}{dx} \right] = \frac{\frac{d}{dt} \left[ \frac{dy}{dx} \right]}{\frac{dx}{dt}}</math>.</p>
<p>15. Given the position vector of a particle moving in the plane is <math>r(t) = \langle x(t), y(t) \rangle</math>. Find the velocity vector.</p>	<p>Recall that the velocity vector is <math>v(t) = \langle x'(t), y'(t) \rangle</math> which means that you must differentiate <math>x(t)</math> and <math>y(t)</math> respect to <math>t</math> and then write a vector.</p>
<p>16. The position vector of a particle moving in the plane is <math>r(t) = \langle x(t), y(t) \rangle</math>. Find the acceleration vector.</p>	<p>Recall that the acceleration vector is <math>a(t) = \langle x''(t), y''(t) \rangle</math> which means that you must differentiate <math>x'(t)</math> and <math>y'(t)</math> respect to <math>t</math> and then write a vector.</p>
<p>17. The position vector of a particle moving in the plane is <math>r(t) = \langle x(t), y(t) \rangle</math>. Find the speed of the particle at a moment at time <math>t = a</math>.</p>	<p>Recall that speed is the magnitude of the velocity vector and is found by calculating <math> v(a)  =  \langle x'(a), y'(a) \rangle  = \sqrt{(x'(a))^2 + (y'(a))^2}</math></p>
<p>18. Given the velocity vector <math>v(t) = \langle x'(t), y'(t) \rangle</math> and position vector at <math>t = 0</math> as <math>\langle x(0), y(0) \rangle</math>, find the position vector at time <math>t = a</math>.</p>	<p>Recall that the position vector is <math>\left\langle x(0) + \int_0^a x'(t) dt, y(0) + \int_0^a y'(t) dt \right\rangle</math></p>

<p>19. Given <math>v(t) = \langle x'(t), y'(t) \rangle</math> determine when the particle is stopped.</p>	<p>You must consider both <math>x'(t)</math> and <math>y'(t)</math>. You need to determine when both <math>x'(t)</math> and <math>y'(t)</math> equal zero.</p>
<p>20. Given <math>v(t) = \langle x'(t), y'(t) \rangle</math> find the slope of the tangent line to the vector at <math>t_1</math>.</p>	<p>You must calculate <math>\frac{dy}{dx} = \frac{y'(t)}{x'(t)}</math> and evaluate this expression at <math>t_1</math>.</p>
<p>21. Given a particle moves along a function <math>y = 3x^2 + 1</math>, the rate of change of <math>x</math> or <math>\frac{dx}{dt} = 3t</math> for <math>t &gt; 0</math> and <math>x(0) = 1</math>. Find the particle's position at time <math>t = 3</math>.</p>	<p>Find the change in the <math>x</math> direction or  <math>x(3) = x_0 + \int_0^3 x'(t) dt = 1 + \int_0^3 (3x^2 + 1) dt = 31</math>. Determine the <math>y</math> coordinate using the function  <math>y = f(x) = 3(31^2) + 1 = 2884</math>. Write the coordinate: (31, 2884)</p>
<p>22. Find the slope of the tangent line to the polar curve <math>r = f(\theta)</math>.</p>	<p>Recall that  <math display="block">x = r \cos \theta, y = r \sin \theta \Rightarrow \frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}}</math></p>
<p>23. Given a polar curve <math>r = f(\theta)</math>, find horizontal tangents to curve.</p>	<p>Recall that <math>x = r \cos \theta, y = r \sin \theta</math> and then find where <math>r \sin \theta = 0</math> and where <math>r \cos \theta \neq 0</math></p>
<p>24. Find vertical tangents to a polar curve <math>r = f(\theta)</math>.</p>	<p>Recall that <math>x = r \cos \theta, y = r \sin \theta</math> and then find where <math>r \cos \theta = 0</math> and where <math>r \sin \theta \neq 0</math></p>
<p>25. Find the area inside one of the petals on the flower described by <math>r = 2 \cos(3\theta)</math>.</p>	<p>Recall that one petal can be traced by <math>-\frac{\pi}{6} \leq \theta \leq \frac{\pi}{6}</math> and the area can be found by calculating the integral</p>

<p>26. Find the area outside <math>r_1(\theta)</math> but inside <math>r_2(\theta)</math>.</p>	<p>First find the points of intersection <math>\theta = a</math> and <math>\theta = b</math> and then integrate <math>\int_a^b \frac{1}{2}(r_2(\theta) - r_1(\theta))^2 d\theta</math></p>
<p>27. Find the arc length of a function <math>r_1(\theta)</math> from <math>\theta = a</math> and <math>\theta = b</math>.</p>	<p>Recall the <math>x = r \cos \theta</math> and <math>y = r \sin \theta</math> to convert from polar form to parametric form. Then use the integral for arc length with parametric equations. Perform the integral <math>\int_a^b \sqrt{\left(\frac{dx}{d\theta}\right)^2 + \left(\frac{dy}{d\theta}\right)^2} d\theta</math></p>
<p>28. Find the sum <math>\frac{3}{2} + \frac{1}{2} + \frac{1}{6} + \frac{1}{216} + \dots</math>.</p>	<p>Notice that the sum is a geometric series where <math>a = \frac{3}{2}</math> and <math>r = \frac{1}{3}</math> so the sum is given by <math>\frac{a}{1-r} = \frac{\frac{3}{2}}{1-\frac{1}{3}} = 1\frac{1}{2}</math></p>
<p>29. Determine if the series <math>\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \dots + \frac{n}{n+1} + \dots</math> converges or diverges</p>	<p>Think about the <math>n</math>th term in this series: <math>\frac{n}{n+1}</math>. By the <math>n</math>th term test, since <math>\lim_{n \rightarrow \infty} \frac{n}{n+1} = 1 \neq 0</math> the series diverges.</p>
<p>30. Determine if the series <math>\sum_{n=1}^{\infty} \frac{3}{n+1}</math> converges or diverges</p>	<p>Think about using the integral test. <math>\int_1^{\infty} \frac{3}{x+1} dx = \lim_{b \rightarrow \infty} \int_1^b \frac{3}{x+1} dx = \lim_{b \rightarrow \infty} \ln \frac{b+1}{2} = \infty</math> Therefore, the series diverges since the integral diverges.</p>

<p>31. Determine if the series <math>\sum_{n=1}^{\infty} \frac{1}{x^{\frac{3}{2}}}</math> converges or diverges.</p>	<p>One test you might think of using is the p-series test. Since <math>p = \frac{3}{2} &gt; 0</math> converges.</p>
<p>32. Determine if the series <math>\sum_{n=1}^{\infty} \frac{1 + \sin x}{x^2}</math> converges or diverges.</p>	<p>Since the series <math>\sum_{n=1}^{\infty} \frac{2}{x^2}</math> converges and <math>0 &lt; \frac{1 + \sin x}{x^2} \leq \frac{2}{x^2}</math> the series converges by the comparison test.</p>
<p>33. Determine if the series <math>\sum_{n=1}^{\infty} \frac{3^n}{4^n + 1}</math> converges or diverges.</p>	<p>Using the ratio test,  <math display="block">\lim_{n \rightarrow \infty} \frac{\frac{3^{n+1}}{4^{n+1} + 1}}{\frac{3^n}{4^n + 1}} = \frac{3}{4^{n+1} + 1} (4^n + 1) &lt; \frac{3}{4^{n+1}} (4^n) = \frac{3}{4} &lt; 1</math> So the series converges.</p>
<p>34. Determine if the series <math>\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{n}</math> converges or diverges.</p>	<p>Using the alternating series test, since each term <math>\frac{1}{n}</math> decreases as <math>n</math> approaches infinity and converges to 0, then the alternating series converges.</p>
<p>35. Write a series for <math>x \cos x</math> where <math>n</math> is an integer</p>	<p>Recall that <math>\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots</math> and then multiply through by <math>x</math>.</p>
<p>36. Write a series for <math>\ln(1 + 3x)</math> centered at <math>x = 0</math>.</p>	<p>Recall that <math>\ln(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \dots + (-1)^{n-1} \frac{x^n}{n} + \dots</math>  Substitute <math>3x</math> for <math>x</math>.</p>

<p>37. If <math>f(x) = 2 + x + \frac{1}{2}x^2 + \frac{1}{4}x^3 + \dots</math> represents a Taylor Polynomial about <math>x = 0</math>, find <math>f(-2)</math></p>	<p>Notice that <math>f(x)</math> is a geometric series with <math>a = 2</math> and <math>r = \frac{1}{2}x</math> so the sum of the series can be written as <math>\frac{a}{1-r}</math> or</p> $\left. \frac{2}{1 - \frac{1}{2}x} \right _{x=-2} = \frac{2}{1 - \frac{1}{2}(-2)} = 1$
<p>38. Write the <math>n</math>th degree Taylor Polynomial for <math>f(x)</math> at <math>x = c</math>.</p>	$T_n(x) = f(c) + f'(c)(x-c) + f''(c)\frac{(x-c)^2}{2!} + \dots + f^{(n)}(c)\frac{(x-c)^n}{n!} + \dots$
<p>39. Given a Taylor series, find the Lagrange form of the remainder for the 4<sup>th</sup> term.</p>	<p>This error is no greater than the value of the 5<sup>th</sup> term at some value of <math>a</math> between <math>x</math> and <math>c</math>. <math>R_n(x) = \frac{f^{(n+1)}(a)}{(n+1)!}(x-c)^{n+1}</math></p>
<p>40. Let <math>S_4</math> be the sum of the first 4 terms of an alternating series for <math>f(x)</math>. Approximate <math> f(x) - S_4 </math>.</p>	<p>You should recognize this as the error for the 4<sup>th</sup> term of an alternating series which is no greater than the absolute value of the 5<sup>th</sup> term.</p>
<p>41. Given the polynomials <math>f(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots</math>, what is <math>f(x)</math>?</p>	$f(x) = e^x$
<p>42. Given the polynomial <math>f(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots + \frac{(-1)^n x^{2n+1}}{(2n+1)!} + \dots</math>, what is <math>f(x)</math>?</p>	$f(x) = \sin(x)$
<p>43. Given the polynomial <math>f(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots + \frac{(-1)^n x^{2n}}{(2n)!} + \dots</math>, what is <math>f(x)</math>?</p>	$f(x) = \cos(x)$

44. Find the interval of convergence of a series.	Apply the ratio test to find the interval and then test convergence at the endpoints.
45. Find $\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$	Check to see if you can use L'Hopital's Rule. Check to see if $f(a) = g(a) = 0$ or $f(a) = g(a) = \infty$ . If this is true, then $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{f'(a)}{g'(a)}$ . You may have to repeat these steps.
46. Find $\int \frac{dx}{x^2 + x - 12}$	Use partial fraction to set up two integrals: $\int \frac{A}{x+4} dx + \int \frac{B}{x-3} dx$ . Solve for A and B and then complete the integration. $\int \frac{-1}{x+4} dx + \int \frac{1}{x-3} dx = \frac{1}{7} \ln \left  \frac{x-3}{x+4} \right  + C$