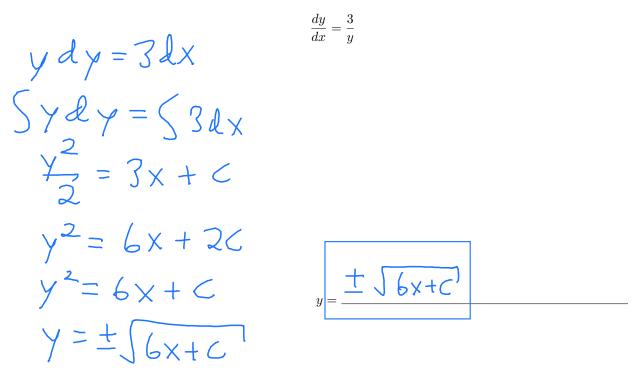
Please show **all** your work! Answers without supporting work will not be given credit. Write answers in spaces provided.

Name:\_

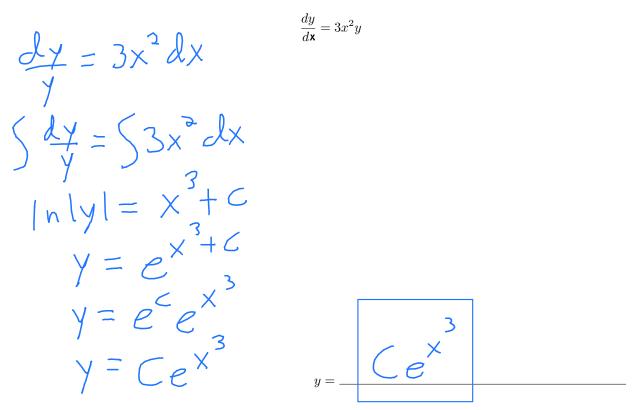
1. Find the general solution to the given differential question. Use C as an arbitrary constant.

Note there are 
$$2 \text{ ways } \frac{dy}{dt} - 15y = 0$$
  $\ln|y| = 15 \pm C$   
to do this problem.  
(1) Separation of Variables  $y = e^{15\pm C}$   
(2) First-Order Linear Eqn  $y = e^{-C}e^{15\pm C}$   
By method 1,  $y = Ce^{15\pm C}$   
 $\frac{dy}{dt} = 15 \text{ dt}$   
 $\frac{dy}{dt} = 15 \text{ dt}$   
 $\frac{dy}{dt} = 15 \text{ dt}$   
 $y = Ce^{15\pm C}$ 

2. Find the general solution to the given differential question. Use C as an arbitrary constant.



3. Find the general solution to the given differential question. Use C as an arbitrary constant.



4. Find the general solution to the given differential question. Use C as an arbitrary constant.

$$e^{Y} = 8e^{-4f} e^{-7} dt \qquad \frac{dy}{dt} = 8e^{-4t-y}$$

$$e^{Y} dy = 8e^{-4f} dt$$

$$Se^{Y} dy = 58e^{-4f} dt$$

$$e^{Y} = \frac{8}{-4}e^{-4f} + C$$

$$e^{Y} = -2e^{-4f} + C$$

$$y = \ln(-2e^{-4f} + C)^{y} = \frac{\ln(-2e^{-4f} + C)}{2}$$

5. Find the particular solution to the differential equation.

$$2y dy = (3x+2) dx \quad \frac{dy}{dx} = \frac{3x+2}{2y} \text{ and } y(0) = 4$$
  

$$52y dy = 5(3x+2) dx \quad 56 \quad y^2 = \frac{3x}{2} + 2x + 16$$
  

$$y^2 = \frac{3x^2}{2} + 2x + 6 \quad y = \pm \sqrt{\frac{3x^2}{2}} + 2x + 16$$
  

$$y = \pm \sqrt{\frac{3x^2}{2}} + 2x + 16$$

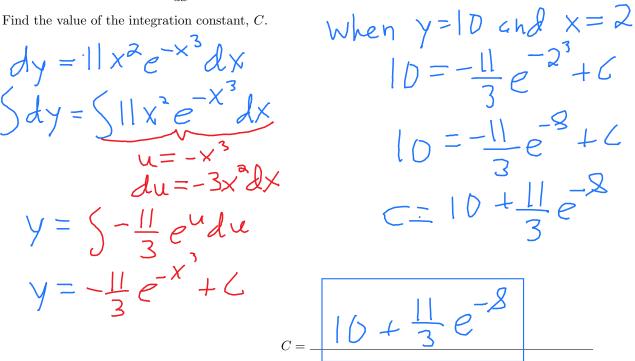
when 
$$y(0) = 4$$
  
 $4^{2} = 0 + 0 + C$   
 $16 = C$   
 $y = \frac{3x^{2} + 3x + 16}{2}$ 

6. Find the particular solution to the differential equation.

7. Consider the following IVP:

$$\frac{dy}{dx} = 11x^2e^{-x^3}$$
 where  $y = 10$  when  $x = 2$ 

Find the value of the integration constant, C.



8. What is the **integrating factor** of the following differential equation?

$$\frac{2y' + \left(\frac{6}{x}\right)y = 10\ln(x)}{2}$$

$$y' + \frac{3}{x}y = 5\ln x$$

$$p(x) = \frac{3}{x} \quad Q(x) = 5\ln x$$

$$u(x) = \exp[5\frac{3}{x}dx]$$

$$= \exp[5\ln x]$$

$$= \exp[5\ln x]$$

$$= x^{3}$$

$$x$$

9. What is the **integrating factor** of the following differential equation?

-

$$\frac{(x+1)\frac{dy}{dx} - 2(x^2 + x)y = (x+1)e^{x^2}}{(x+1)}$$

$$\frac{dy}{(x+1)} - \frac{\partial x(x+1)}{(x+1)}y = e^{x^2}$$

$$\frac{dy}{dx} - \frac{\partial x(x+1)}{(x+1)}y = e^{x^2}$$

$$\frac{dy}{dx} + (-\partial x) \cdot y = e^{x^2}$$

$$\int (x) = e^{x}\rho[\langle \rho(x) \lambda x \rangle]$$

$$= e^{x}\rho[\langle -\lambda^2 \rangle]$$

$$u(x) = \begin{bmatrix} e^{-x^2} \\ e^{-x^2} \end{bmatrix}$$

10. What is the **integrating factor** of the following differential equation?

$$u(x) = exp[SP(x)dx]$$
  

$$= exp[S(t+x)dx]$$
  

$$= exp[S(t+x)dx]$$
  

$$u = sinx dx$$
  

$$u = sinx dx$$
  

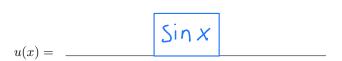
$$= exp[Sdu]$$
  

$$= exp[In u]$$
  

$$u(x) = exp[In sinx]$$
  

$$= sin x$$

 $y' + \cot(x) \cdot y = \sin^2(x)$ 



11. Solve the initial value problem.

$$x^4y' + 4x^3 \cdot y = 10x^9$$
 with  $f(1) = 23$ 

$$\frac{x^{4}y' + 4x^{3}y}{x^{4}} = \frac{10x^{4}}{x^{4}}$$

$$\frac{y' + \frac{4}{x} \cdot y}{x^{4}} = 10x^{5}$$

$$P(x) = \frac{4}{x} \quad Q(x) = 10x^{5}$$

$$u(x) = exp[\langle P(x)dx \rangle]$$

$$= exp[\langle P(x)dx \rangle]$$

$$= exp[\langle Ydx \rangle]$$

$$= exp[(1nx^{4})]$$

$$= x^{4}$$

$$y \cdot u(x) = \int Q(x)u(x)dx + C$$

$$y \cdot x^{T} = \int 10x^{5}x^{4}dx + C$$

$$y \cdot x^{4} = \int 10x^{7}dx + C$$

$$y \cdot x^{4} = x^{10} + C$$

$$y = \frac{x^{10}}{x^{14}} + \frac{C}{x^{4}}$$

$$y = x^{6} + \frac{C}{x^{4}}$$

$$23 = |+ \frac{-1}{7}$$
  

$$22 = -2$$
  

$$y = -22$$
  

$$y = -22$$
  

$$x^{4}$$

$$y = \frac{22}{x^{4}}$$

12. (a) Use summation notation to write the series in compact form.

$$1 - 0.6 + 0.36 - 0.216 + \dots$$

$$= 1 - \frac{6}{10} + \frac{56}{100} - \frac{216}{1000} + \dots$$

$$= 1 - \frac{6}{10} + \left(\frac{6}{10}\right)^2 - \left(\frac{6}{10}\right)^3 + \dots$$

$$= \sum_{h=0}^{\infty} (-1)^n \left(\frac{6}{10}\right)^n$$

$$= \sum_{h=0}^{\infty} \left(\frac{-6}{10}\right)^n$$
Answer:

(b) Use the sum from (a) and compute the sum.

$$\sum_{n=0}^{\infty} \left(\frac{-6}{10}^{n}\right) = \frac{1}{1 - (-6/b)} = \frac{1}{1 + 6/10} = \frac{1}{1 \cdot 6/10} = \frac{10}{1 \cdot 6} = \frac{5}{8}$$

$$5/\lambda$$

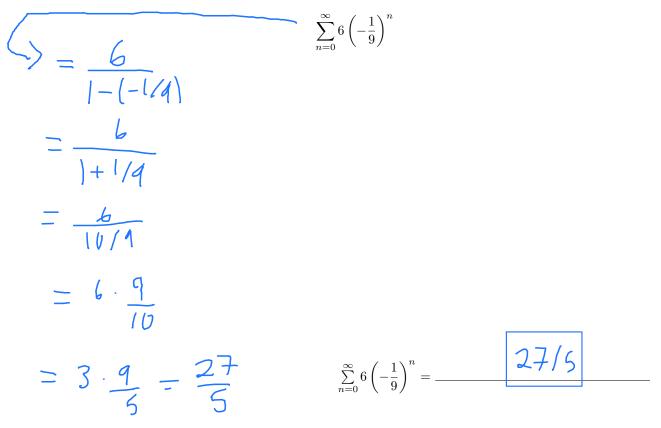
Answer:\_

13. If the given series converges, then find its sum. If not, state that it diverges.

Note 
$$r = 3/2$$
 and  
 $\left|\frac{3}{2}\right| < 1$  is false  
So the sum diverges



14. If the given series converges, then find its sum. If not, state that it diverges.



15. If the given series converges, then find its sum. If not, state that it diverges.

$$\sum_{n=0}^{\infty} \left(\frac{7}{4^n}\right)$$

$$= \sum_{n=0}^{\infty} 7\left(\frac{1}{4^n}\right)^n$$

$$= \frac{7}{1-1/4}$$

$$= \frac{7}{3/4}$$

$$= 7 \cdot \frac{4}{3} = \frac{28}{3}$$

$$\sum_{n=0}^{\infty} \left(\frac{7}{4^n}\right) = 28/3$$

## 16. Compute

$$\sum_{n=1}^{\infty} \frac{5^{n+2}}{6^n}$$

$$= \frac{5}{6} + \frac{5}{6^2} + \frac{5}{6^3} + \dots$$

$$= \frac{5}{6} + \frac{5}{6} + \frac{5}{6} + \frac{5}{6} + \dots$$

$$= \frac{125}{6} \sum_{n=0}^{\infty} \left(\frac{5}{6}\right)^n = \frac{125}{6} \cdot \frac{1}{1-5/6}$$

$$= \frac{125}{6} \cdot \frac{1}{1/6} = \frac{125}{6} \cdot \frac{6}{1} = \frac{125}{5}$$

$$\sum_{n=1}^{\infty} \frac{5^{n+2}}{6^n} = \frac{125}{5}$$

17. Compute

$$\sum_{n=0}^{\infty} \frac{(-2)^{n}}{3 \cdot 3^{2n}}$$

$$= \sum_{n=0}^{\infty} \frac{(-2)^{n}}{3 \cdot 3^{2n}}$$

$$= \sum_{n=0}^{\infty} \frac{1}{3} \cdot \frac{(-2)^{n}}{(3^{2})^{n}}$$

$$= \sum_{n=0}^{\infty} \frac{1}{3} \left(-\frac{2}{9}\right)^{n}$$

$$= \frac{1/3}{1-(-2/9)}$$

$$= \frac{1/3}{1-(-2/9)}$$

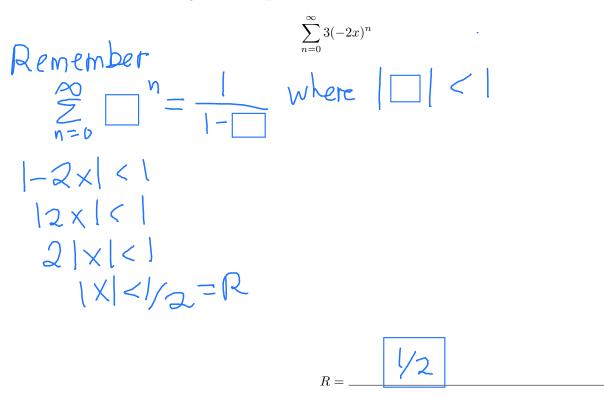
$$= \frac{1/3}{1/9}$$

$$\sum_{n=0}^{\infty} \frac{(-2)^{n}}{3^{2n+1}} = \frac{3/11}{3}$$

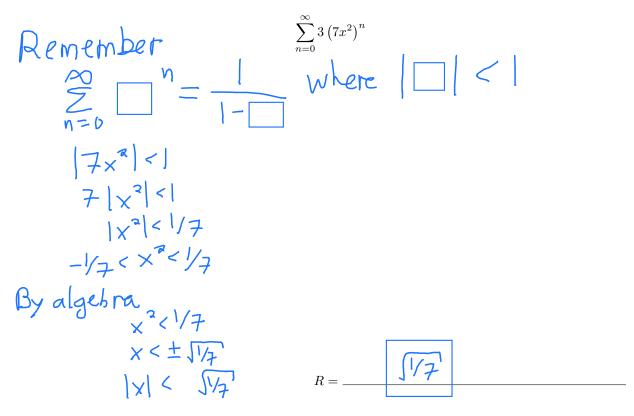
$$= \frac{1}{3} \cdot \frac{9}{11}$$

$$= \frac{3/11}{9}$$

18. Find the radius of convergence for the power series shown below.



19. Find the radius of convergence for the power series shown below.



20. Express 
$$f(x) = \frac{3}{1+2x}$$
 as a power series and determine it's radius of converge.  

$$\frac{3}{1+2x} = \frac{3}{1} \cdot \frac{1}{1+2x} = \frac{3}{1} \cdot \frac{1}{1-(-2x)}$$

$$\frac{1}{1-(-2x)} = \sum_{n=0}^{\infty} (-2x)^n \text{ where } |-2x| < 1$$

$$f(x) = \frac{3}{1-(-2x)} = 3\sum_{n=0}^{\infty} (-2x)^n \text{ where } 2|x| < 1$$

$$= \sum_{n=0}^{\infty} 3(-1)^n 2^n x^n \text{ where } 3|x| < \frac{1}{2}$$

$$\frac{3}{1+2x} = \frac{1}{1/2}$$

$$\frac{3}{1+2x} = \frac{1}{1/2}$$

21. Express 
$$f(x) = \frac{5x}{3+2x^2}$$
 as a power series and determine it's radius of converge.  

$$\frac{5\times}{3([+2x^2/3])} = \frac{5\times}{3} \cdot \frac{1}{1-(-(2x^2/3))} = \frac{5\times}{3} \cdot \frac{1}{1-(-(2x^2/3))} = \frac{2}{3} |x^2| < |$$

$$\frac{1}{|-(-2x^2/3)|} = \frac{5\times}{3} \cdot \frac{(-2x^2)^n}{3} \text{ where } |-\frac{2x^2}{3}| < |$$

$$\frac{1}{|-(-2x^2/3)|} = \frac{5\times}{3} \cdot \frac{\infty}{3} \cdot \frac{(-2x^2)^n}{3} \text{ where } |-\frac{2x^2}{3}| < |$$

$$\frac{1}{|-(-2x^2/3)|} = \frac{5\times}{3} \cdot \frac{\infty}{3} \cdot \frac{(-1)^n 2x^2}{3} = \frac{5\times}{3} \cdot \frac{\infty}{3} \cdot \frac{(-1)^n 2x^2}{3} + \frac{2}{3} = \frac{5\times}{3} \cdot \frac{2}{3} + \frac{1}{3} = \frac{5\times}{3} \cdot \frac{2}{3} \cdot \frac{(-1)^n 2x^2}{3} + \frac{1}{3} = \frac{5\times}{3} \cdot \frac{2}{3} \cdot \frac{(-1)^n 2x^2}{3} + \frac{2}{3} = \frac{5\times}{3} \cdot \frac{(-1)^n 2x^2}{3} + \frac{1}{3} = \frac{5\times}{3} \cdot \frac{(-1)^n 2x^2}{3} + \frac{2}{3} = \frac{5\times}{3} \cdot \frac{(-1)^n 2x^2}{3} + \frac{1}{3} = \frac{5\times}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} = \frac{5\times}{3} = \frac{5\times}{3} + \frac{1}{3} = \frac{5\times}{3} = \frac{5\times}{3$$

22. What are the first 3 non-zero terms of the Maclaurin series representation of the follow?

$$\begin{aligned} \sin x &= \sum_{n=\nu}^{\infty} \frac{(-1)^{n}}{(2n+1)!} x^{2n+1} \\ \sin (x^{3/2}) &= \sum_{n=0}^{\infty} \frac{(-1)^{n}}{(2n+1)!} (x^{3/2})^{2n+1} \\ &= \sum_{n=\nu}^{\infty} \frac{(-1)^{n}}{(2n+1)!} x^{3n+3/2} \end{aligned}$$

$$\int \sin(x^{3/2}) dx$$

$$\int \int \sin(x^{3/2}) dx = \int \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{3n+\frac{3}{2}} dx$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} \int x^{3n+\frac{3}{2}} dx$$

$$= \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} \frac{x^{3n+\frac{5}{2}}}{3n+\frac{5}{2}}$$

$$= \frac{x^{5/2}}{5/2} - \frac{x^{11/2}}{6 \cdot (\frac{5}{2}+\frac{5}{2})} + \frac{x^{17/5}}{5! (6+\frac{5}{2})}$$

$$\int \sin(x^{3/2}) dx = \frac{\frac{x^{5/2}}{5/2} - \frac{x^{11/2}}{6 \cdot (\frac{5}{2}+\frac{5}{2})} + \frac{x^{17/5}}{5! (6+\frac{5}{2})}$$

5! (6+5/2)

23. Use a power series to approximate the definite integral using the first 4 terms of the series. Round to 5 decimal places.

$$\frac{1}{|x|^{4}} = \frac{1}{|-(-x^{4})|} = \sum_{n=0}^{\infty} (-x^{4})^{n} = \sum_{k=0}^{\infty} (-1)^{n} x^{4n}$$

$$\int_{0}^{0.11} \frac{1}{1+x^{4}} dx$$

$$\int_{0}^{0.11} \frac{1}{|x|^{4}} dx = \int_{0}^{\alpha,||} \sum_{n=0}^{\infty} (-1)^{n} x^{4n} dx$$

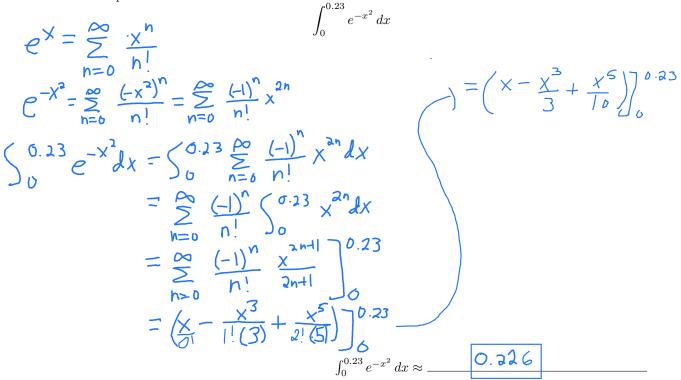
$$= \sum_{k=0}^{\infty} (-1)^{n} \int_{0}^{0.11} x^{4n} dx$$

$$= \sum_{k=0}^{\infty} (-1)^{n} \sum_{k=0}^{0.11} \sqrt{n} dx$$

$$= \sum_{k=0}^{\infty} (-1)^{n} \frac{x^{4n} dx}{|x^{n+1}|} = \sum_{k=0}^{0} (-1)^{n} \frac{x^{4n} dx}{|x^{n+1}|}$$

$$= \sum_{k=0}^{\infty} (-1)^{n} \frac{x^{4n} dx}{|x^{n+1}|} = \sum_{k=0}^{0} (-1)^{n} \frac{x^{4n} dx}{|x^{n+1}|} = \sum_$$

24. Use a power series to approximate the definite integral using the first 3 terms of the series. Round to 5 decimal places.



25. Use a power series to approximate the definite integral using the first 4 terms of the series. Round to 5 decimal places.

$$C_{US}(x) = \sum_{h=0}^{\infty} \frac{(-1)^{n}}{(2h)!} x^{2n}$$

$$C_{0S}(Jx) = \sum_{h=0}^{\infty} \frac{(-1)^{n}}{(2h)!} (x^{V_{0}})^{2n}$$

$$= \sum_{h=0}^{\infty} \frac{(-1)^{n}}{(2h)!} (x^{V_{0}})^{2n}$$

$$= \sum_{h=0}^{\infty} \frac{(-1)^{n}}{(2n)!} x^{n}$$

$$= \sum_{h=0}^{\infty} \frac{(-1)^{n}}{(2n)!} x^{n}$$

$$= \sum_{h=0}^{\infty} \frac{(-1)^{n}}{(2n)!} x^{n}$$

$$= \sum_{h=0}^{\infty} \frac{(-1)^{n}}{(2n)!} x^{n}$$

$$= \sum_{h=0}^{\infty} \frac{(-1)^{n}}{(2n)!} (x^{N+1})$$

26. Use the first 3 terms of the Macluarin series for  $f(x) = \ln(1+x)$  to evaluate ln(1.56). Round to 5 decimal places.

$$\ln (1+x) = \sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n} x^{n}$$
Note  $1.56 = 1 + 0.51$ 

$$\ln (1+0.56) = \sum_{h=1}^{\infty} \frac{(-1)^{n-1}}{n} (0.56)^{n}$$

$$= 0.56 - (0.56)^{2} + (0.51)^{3}$$

$$\ln (1.56) \approx \qquad 0.46 | 74 |$$

27. Find the domain of  

$$\begin{array}{c}
7? \rightarrow ? \geq 0 \\
\sqrt{x+y-1} \rightarrow x+y-1 \geq 0 \\
x+y \geq 1
\end{array}$$

$$f(x,y) = \frac{\sqrt{x+y-1}}{\ln(y-11)-9} \\
\ln(?) \rightarrow ? \geq 0 \\
\ln(y-11) \rightarrow y-11 \geq 0 \\
\ln(y-11) \rightarrow y-11 \geq 0 \\
y \geq 11
\end{array}$$

$$\begin{array}{c}
\ln(y-11) = 9 \\
y \geq 11
\end{array}$$

$$\begin{array}{c}
1n(y-11) = 9 \\
y \geq 11
\end{array}$$

$$\begin{array}{c}
1n(y-11) = 9 \\
y \geq 11
\end{array}$$

$$\begin{array}{c}
1n(y-11) = 9 \\
y \geq 11
\end{array}$$

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$$\begin{array}{c}
1n(y-11) = 9 \\
y \geq 11
\end{array}$$

$$\begin{array}{c}
1n(y-11) = 9 \\
y \geq 11
\end{array}$$

28. Find the domain of  

$$f(x,y) = \frac{\ln(x^2 - y + 3)}{\sqrt{x - 6}}$$

$$f(x,y) = \frac{\ln(x^2 - y + 3)}{\sqrt{x - 6}}$$

$$f(x,y) = \frac{\ln(x^2 - y + 3)}{\sqrt{x - 6}}$$

$$x^2 + 3 > y$$

$$\frac{1}{\sqrt{7}} \rightarrow 7 > 0$$

$$\frac{1}{\sqrt{x - 6}} \rightarrow x - 6 > 0$$

$$x > 6$$
Domain =

Domain = 
$$\frac{\left\{\left(\chi,\gamma\right)\right\}\times\left(\chi^{2}+3\right)}{\left\{\left(\chi,\gamma\right)\right\}\times\left(\chi^{2}+3\right)}$$

29. Describe the indicated level curves f(x, y) = C

$$f(x,y) = \ln(x^{2} + y^{2}) \quad C = \ln(36)$$

$$(n(\chi^{2} + \gamma^{2}) = n(36))$$

$$(n) \text{ and radius } 6$$

$$\chi^{2} + \gamma^{2} = 36$$

$$\chi^{2} + \gamma^{2} = 6^{2}$$

- (a) Parabola with vertices at (0,0)
- (b) Circle with center at  $(0, \ln(36))$  and radius 6
- (c) Parabola with vertices at  $(0, \ln(36))$
- (d) Circle with center at (0,0) and radius 6
- (e) Increasing Logarithm Function

30. What do the level curves for the following function look like?

$$f(x, y) = \ln(y - e^{5x})$$
(a) Increasing exponential functions
(b) Rational Functions with x-axis symmetry
(c) Natural logarithm functions
(d) Decreasing exponential functions
(e) Rational Functions with y-axis symmetry
(for the function of the function

(e) Rational Functions with y-axis symmetry

31. What do the level curves for the following function look like?

32. Compute  $f_x(6,5)$  when

$$f_{\chi}(x_{f}y) = \frac{d}{d\chi} \left( \frac{(6x+6y)^{2}}{\sqrt{y^{2}-1}} \right)$$

$$f(x,y) = \frac{(6x-6y)^{2}}{\sqrt{y^{2}-1}}$$

$$= \frac{1}{\sqrt{y^{2}-1}} \frac{d}{d\chi} \left( (6x+6y)^{2} \right)$$

$$= \frac{1}{\sqrt{y^{2}-1}} \cdot 2(6x+6y) \frac{d}{d\chi} \left( (6x+6y) \right)$$

$$= \frac{1}{\sqrt{y^{2}-1}} \cdot 2(6x+6y) \cdot 6$$

$$= \frac{1}{\sqrt{y^{2}-1}} \cdot 2(6x+6y) \cdot 6$$

$$= \frac{1}{\sqrt{y^{2}-1}} \cdot 2(6x+6y) \cdot 6$$

$$f_{x}(6,5) = \frac{792}{\sqrt{24}}$$

33. Find the first order partial derivatives of

$$\begin{aligned} f(x,y) &= 3x^{2} \cdot \frac{\sqrt{3}}{(y-1)^{2}} \qquad f(x,y) = \frac{3x^{2}y^{3}}{(y-1)^{2}} \\ f_{\chi}(x/\gamma) &= \frac{d}{dx} \left( 3x^{2} \cdot \frac{\sqrt{3}}{(y-1)^{2}} \right) = \frac{\sqrt{3}}{(y-1)^{2}} \cdot \frac{d}{dx} \left( 3x^{2} \right) = \frac{\sqrt{3}}{(y-1)^{2}} \cdot 6x \\ f_{\gamma}(x/\gamma) &= \frac{d}{d\gamma} \left( 3x^{2} \cdot \frac{\sqrt{3}}{(y-1)^{2}} \right) = 3x^{2} \frac{d}{d\gamma} \left( \frac{\sqrt{3}}{(y-1)^{2}} \right) = 3x^{2} \left( \frac{3y^{2}(y-1)^{2} - \sqrt{3} \cdot 2(y-1)}{(y-1)^{4}} \right) \\ &= 3x^{2} \left( \frac{(y-1)\left[ 3y^{2}(y-1) - 2y^{3} \right]}{(y-1)^{4}} \right) = \frac{3 \times^{2} \left( 3y^{3} - 3y^{2} - 2y^{3} \right)}{(y-1)^{3}} \\ &= \frac{3 \times^{2} \left( \sqrt{3} - 3y^{2} \right)}{(y-1)^{4}} \\ f_{y}(x,y) &= \frac{\frac{6 \times \sqrt{3}^{2} ((y-1)^{2})}{(y-1)^{3}} \end{aligned}$$

34. Find the first order partial derivatives of

$$f(x,y) = (xy-1)^{2}$$

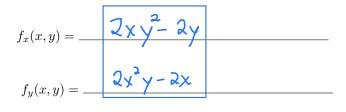
$$f(x,y) = \frac{d}{dx} \left( (xy-1)^{2} \right) = 2 \left( xy-1 \right) \frac{d}{dx} \left( xy-1 \right)$$

$$= 2 \left( xy-1 \right) y$$

$$= 2 \left( xy-1 \right) y$$

$$= 2 \left( xy-1 \right) y$$

$$f_{y}(x_{1}y) = \frac{d}{dy}((x_{y}-1)^{2}) = 2(x_{y}-1)\frac{d}{dy}(x_{y}-1)$$
  
= 2(x\_{y}-1) x  
= 2x^{2}y-2x



35. Given the function  $f(x,y) = 4x^5 \tan(3y)$ , compute  $f_{xy}(2,\pi/3)$ 

$$f_{x}(x_{1}y) = \frac{d}{dx}(4x^{5} + an(3y)) = +an(3y) \cdot \frac{d}{dx}(4x^{5})$$

$$= +an(3y) \cdot (26x^{4})$$

$$f_{xy}(x_{1}y) = \frac{d}{dy}(f_{x}(x_{1}y)) = \frac{d}{dy}(+an(3y) \cdot (20x^{4})) = 26x^{4}\frac{d}{dy}(+an(3y))$$

$$= 20x^{4} \cdot sec^{2}(3y) \cdot 3$$

$$= 60x^{4} \cdot sec^{2}(3y) \cdot 3$$

$$= 60x^{4} \cdot sec^{2}(3y)$$

$$f_{xy}(2\sqrt{1/3}) = 60(2)^{4} \cdot sec^{2}(3\pi/3)$$

$$= 60(16) \cdot sec^{2}(17)$$

$$= 960$$

$$f_{xy}(2,\pi/3) = \frac{960}{6}$$

36. Find the second order partial derivatives of  $\begin{pmatrix} & & \\ & & \\ & & \\ & & \end{pmatrix}$ 

$$f(x,y) = (\chi^{2} \ln(7x)) y \qquad f(x,y) = x^{2} y \ln(7x)$$

$$f(x,y) = \chi^{2} \ln(7x) + \chi^{2} \ln(7x) + \chi^{2} \ln(7x) + \chi^{2}$$

$$= \chi (2 \times \ln(7x) + \chi^{2} \frac{1}{7x} \cdot 7) = \chi (2 \times \ln(7x) + \chi)$$

$$f_{XX}(X,Y) = \frac{d}{dx} \left( Y \left( 2x \ln(7x) + x \right) \right) = Y \frac{d}{dx} \left( 2x \ln(7x) + x \right)$$
  
=  $Y \left( 2 \ln(7x) + 2x \cdot \frac{1}{7x} \cdot 7 + 1 \right) = Y \left( 2 \ln(7x) + 2 + 1 \right)$   
=  $Y \left( 2 \ln(7x) + 3 \right)$ 

$$\begin{aligned} f_{XY}(x,y) &= \frac{d}{dy} \left( y \left( 2 \times \ln(7x) + x \right) \right) = \left( 2 \times \ln(7x) + x \right) \frac{d}{dy} \left( y \right) \\ &= 2 \times \ln(7x) + x \\ f_{Y}(x,y) &= \frac{d}{dy} \left( \left( x^{2} \ln(7x) \right) \cdot y \right) = \left( x^{2} \ln(7x) \right) \frac{d}{dy} \left( y \right) = x^{2} \ln(7x) \\ f_{Y}(x,y) &= \frac{d}{dy} \left( x^{2} \ln(7x) \right) = 0 \end{aligned}$$

$$f_{xx}(x,y) = \frac{\left(2\ln(7x) + 3\right)}{\left(2x\ln(7x) + 3\right)}$$
$$f_{xy}(x,y) = \frac{2x\ln(7x) + x}{f_{yy}(x,y)}$$