Exercises:

1- Determine the domain of each of the following functions

i) $f(x, y) = \ln(y - 2x)$.

ii) $f(x, y) = \dfrac{1}{xy}$.

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

iv) $f(x, y) = \dfrac{x - 1}{\sqrt{x + y + 1}}$.

2- Graph and describe the level curve for the following functions:

a) $f(x, y) = \sqrt{x^2 - y^2}$

b) $f(x, y) = y - x^2 - 1$.

c) $f(x, y) = x^2 + y^2$.

**Exercises**: Find the radius of convergence and interval of convergence for the following power series

1) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} (x)^n$

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

3) $\sum_{n=0}^{\infty} n^n (x)^n$

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

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

6) $\sum_{n=2}^{\infty} \frac{x^n}{(lnn)^2}$

7) $\sum_{n=0}^{\infty} \frac{(x+17)^n}{n!}$

Let $v$ be any nonzero vector. Then $u = v/|v|$ is the unit vector having the same direction as $v$.

Example 3: Find the unit vector having the same direction as $v = 2i - 3j$.

Example 4: Find the vector v whose direction is $\dfrac{5\pi}{4}$ and whose magnitude is 7.

**H.W.**

In Problems 7–18, find the magnitude and direction of the given vector.

7. $v = (4, 4)$

8. $v = (-4, 4)$

9. $v = (4, -4)$

10. $v = (-4, -4)$

11. $v = (\sqrt{3}, 1)$

12. $v = (1, \sqrt{3})$

13. $v = (-1, \sqrt{3})$

14. $v = (1, -\sqrt{3})$

15. $v = (-1, -\sqrt{3})$

16. $v = (1, 2)$

17. $v = (-5, 8)$

18. $v = (11, -14)$

Example 3: Show that $\displaystyle\lim_{(x,y)\to(0,0)} \frac{xy^2}{x^2+y^4}$ dose not exist.

Example 4: Find $\displaystyle\lim_{(x,y)\to(1,0)} \frac{y}{x+y-1}$.

Example 5: Using the epsilon and delta to prove that $\displaystyle\lim_{(x,y)\to(0,0)} \frac{4xy^2}{x^2+y^2} = 0$.

H.W: Prove that $\displaystyle\lim_{(x,y)\to(1,2)} x^2 + 2y = 5$.

H.W: Show that the function $\frac{3x^3y}{x^4+y^4}$, has no limit as $(x,y)$ approaches $(0,0)$.