Lines, Circles and Parabolas

The Concept of a Function

Theory section that includes the following topics:

- General overview about 'what is a function'.
- Notation of functions.
- The domain and definition of a function.
- Graphical Description of a function.

The Linear Function (Lines) and Circles

Questions:

In exercise 1-4, a particle moves from A to B in the coordinate plane.
Find the increments Δx and Δy in the particles coordinates.
Also find the distance from A to B:

1) $\mathrm{A}(-3,4)$, $\mathrm{B}(-1,0)$

2) $\mathrm{A}(-2,-2)$, $\mathrm{B}(-4,2)$

3) $\mathrm{A}(-3.2,-2)$, $\mathrm{B}(-4.3,-2)$

4) $\mathrm{A}(\sqrt{2},3)$, $\mathrm{B}(0,2.5)$

In exercise 5-8, describe the graph of the equations:

5) $x^2+y^2=4$

6) $x^2+y^2=9$

7) $x^2+y^2\le 4$

8) $x^2+y^2=0$

In exercise 9-12, plot the points and find the slope (if any) of the line they determine,
Also find the common slope (if any) of the lines perpendicular to line AB:

9) $\mathrm{A}(1,3)$, $\mathrm{B}(-2,0)$

10) $\mathrm{A}(-2,2)$, $\mathrm{B}(2,-1)$

11) $\mathrm{A}(1,3)$, $\mathrm{B}(-2,3)$

12) $\mathrm{A}(-2,1)$, $\mathrm{B}(-2,-1)$

In exercise 13-16, find an equation for (a) the vertical line and (b) the horizontal line through the given point:

13) $\left(-1,\frac{4}{3}\right)$

14) $\left(\sqrt{2},-1.3\right)$

15) $\left(0,-\sqrt{2}\right)$

16) $\left(-\pi,0\right)$

In exercise 17-20, write an equation for each line described:

17) Passes through $\left(-1,1\right)$ with slope -4.

18) Passes through $\left(2,-2\right)$ with slope $\frac{1}{2}$.

19) Passes through $\left(3,4\right)$ and $\left(-2,8\right)$.

20) Passes through $\left(-8,0\right)$ and $\left(-1,3\right)$.

In exercise 21-24, write an equation for each line described:

21) Has slope -2 and y intercept 6.

22) Has slope $\frac{1}{2}$ and y intercept -4.

23) Passes through $\left(-10,-4\right)$ and has no slope.

24) Passes through $\left(\frac{1}{4},5\right)$ and has no slope.

In exercise 25-26, write an equation for each line described:

25) Has y intercept 5 and x intercept -2.

26) Has y intercept -3 and x intercept 1.

In exercise 27-30, write an equation for each line described:

27) Passes through $(4,-2)$ and is parallel to the line $4x+10y=30$.

28) Passes through $(-\sqrt{2},-4)$ and is parallel to the line $2\sqrt{x}+5y=\sqrt{5}$.

29) Passes through $(2,5)$ and is perpendicular to the line $6x-4y=15$.

30) Passes through $(0,1)$ and is perpendicular to the line $13x-8y=13$.

In exercise 31-34, find the lines x and y intercepts and use this information to graph the line:

31) $4x+5y=20$

32) $2x+y=-4$

33) $\sqrt{4x}-\sqrt{3}y=\sqrt{12}$

34) $x-1.5y=-3$

Final Answers:

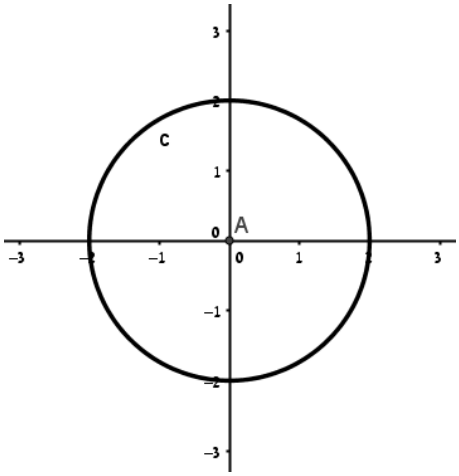
1) $\Delta x = 2,\ \Delta y = -4,\ d = \sqrt{20}$

2) $\Delta x = -2,\ \Delta y = 4,\ d = \sqrt{20}$

3) $\Delta x = -1.1,\ \Delta y = 0,\ d = 1.1$

4) $\Delta x = -\sqrt{2},\ \Delta y = -0.5,\ d = 1.5$

5)



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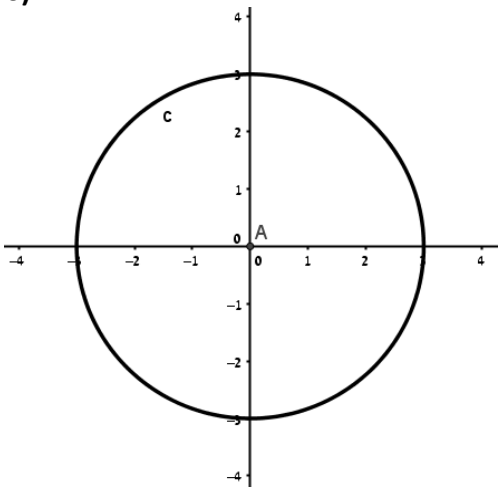

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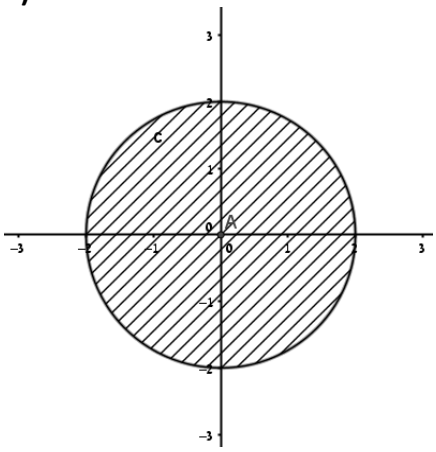

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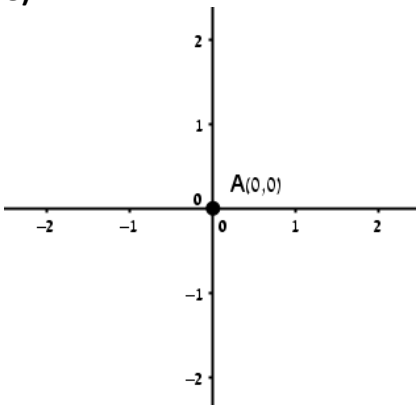
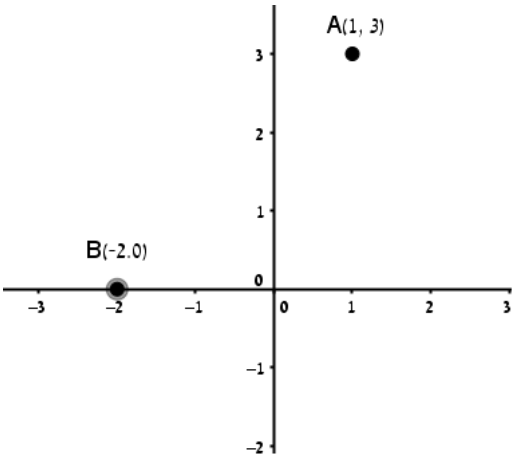
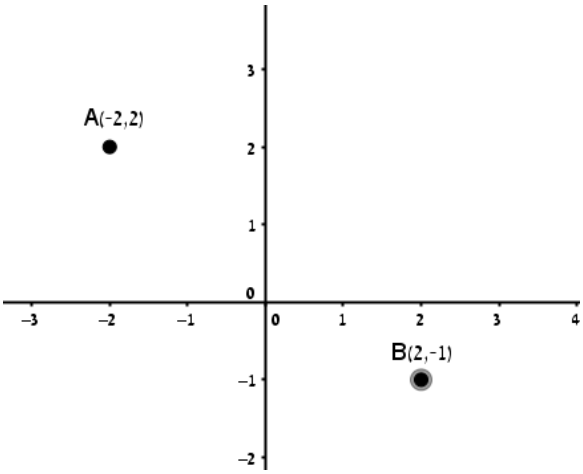


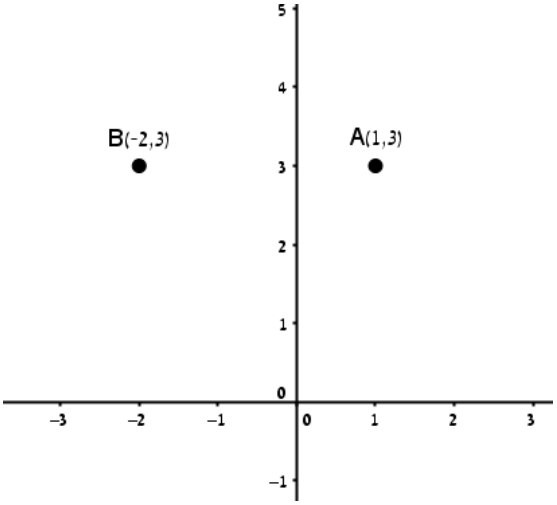
9) $a=3,\quad m=-\frac{1}{3}$



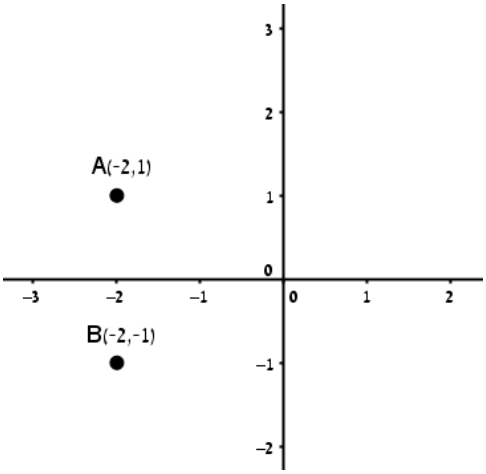
10) $a=\frac{-3}{4},\quad m=\frac{4}{3}$



11) $a=0$, $m=undefined$



12) $a=undefined$, $m=0$



13) Vertical: $x=-1$, Horizontal: $y=\frac{4}{3}$.

14) Vertical: $x=0$, Horizontal: $y=-\sqrt{2}$.

15) Vertical: $x=\sqrt{2}$, Horizontal: $y=-1.3$.

16) Vertical: $x=-\pi$, Horizontal: $y=0$.

17) $y = -4x - 5$

18) $y = \frac{1}{2}x - 3$

19) $y = -\frac{4}{5}x + 6.4$

20) $y = \frac{3}{7}x + \frac{24}{7}$

21) $y = -2x + 6$

22) $y = \frac{1}{2}x - 4$

23) $y = -4$

24) $x = \frac{1}{4}$

25) $y = 2.5x + 5$

26) $y = 3x - 3$

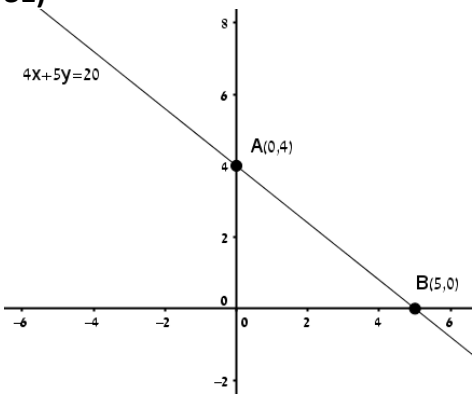
27) $y = \frac{-2}{5}x - \frac{2}{5}$

28) $y = \frac{-\sqrt{2}}{5}x + 3\frac{3}{5}$

29) $y = -\frac{2}{3}x + 6\frac{1}{3}$

30) $y = -\frac{8}{13}x + 1$

31)



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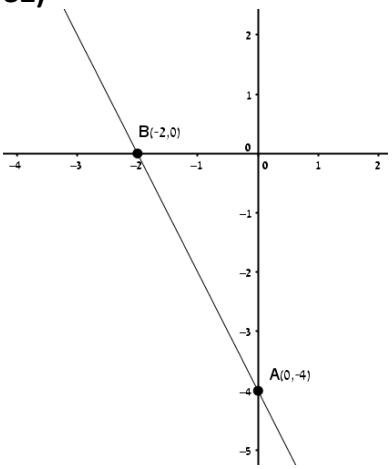

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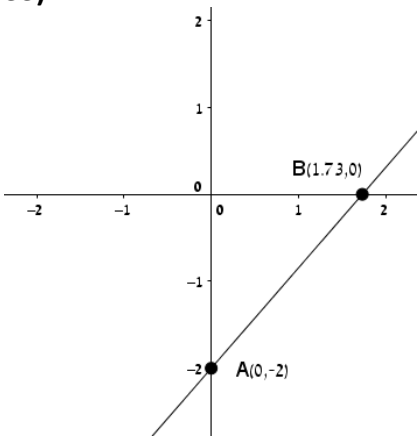

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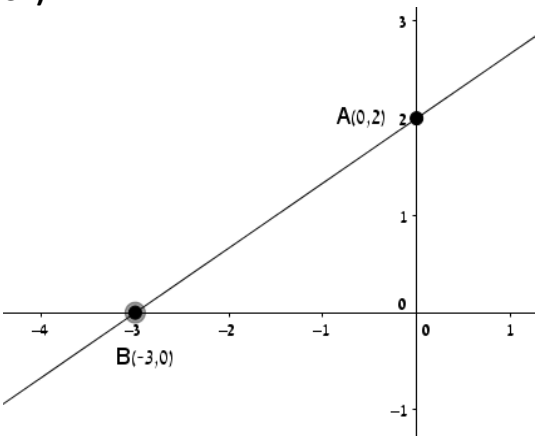


The Quadratic Function (Parabola)

Questions:

1) Answer the following questions:

a. Graph the parabola $y=-x^2+2x+3$.
Label the vertex, axis, and intercepts in each case.

b. Solve: $-x^2+2x+3<0$.

2) Answer the following questions:

a. Graph the parabola $y=2x^2+3x-5$.
Label the vertex, axis, and intercepts in each case.

b. Solve: $2x^2+3x-5\le 0$.

3) Answer the following questions:

a. Graph the parabola $y=x^2+x-1$.
Label the vertex, axis, and intercepts in each case.

b. Solve: $x^2+x+1<0$.

4) Answer the following questions:

a. Graph the parabola $y=-x^2+4x-5$.
Label the vertex, axis, and intercepts in each case.

b. Solve: $-x^2+4x-5<0$.

5) Answer the following questions:

a. Graph the parabola $y=x^2+3x+2$.
Label the vertex, axis, and intercepts in each case.

b. Solve: $x^2+3x+2>5+x$.

6) Answer the following questions:

a. Graph the parabola $y=-x^2-x+6$ and the line $y=-3x+3$.

b. Solve: $-x^2-x+6<-3x+3$.

Final Answers:

1) b. $x<-1$, $x>3$

2) b. $-2.5\le x\le 1$

3) b. no x . Empty set

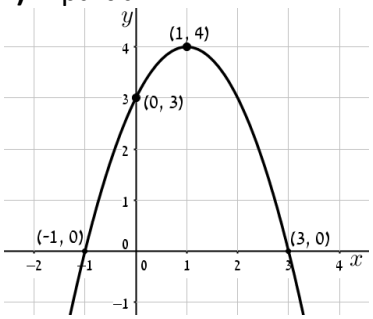
4) b. all x

5) b. $x<-3$, $x>1$

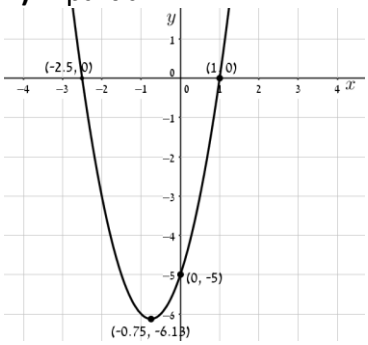
6) b. $x<-1$, $x>3$

Final drawings:

1) part a:



2) part a:



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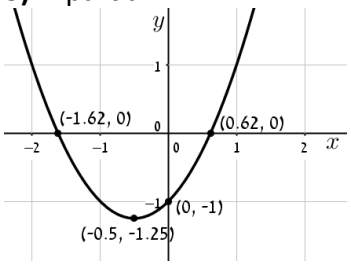

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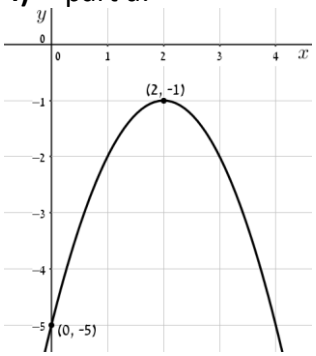
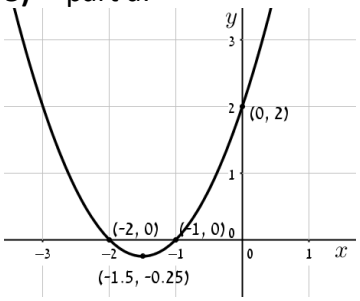


5) part a:



6) part a: