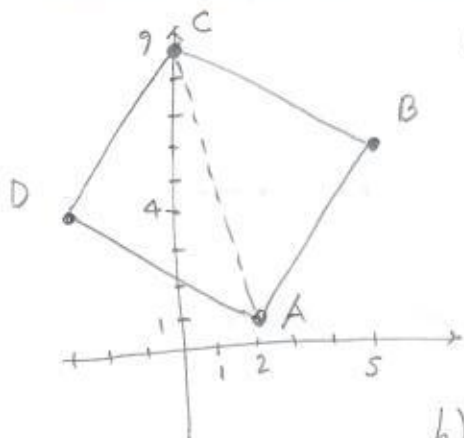


1. (13pts) Draw the quadrilateral with vertices $A = (2, 1)$, $B = (5, 6)$, $C = (0, 9)$ and $D = (-3, 4)$ in the coordinate plane.

a) Compute the lengths of all sides of the quadrilateral and compute the length of the diagonal AC .

b) Determine algebraically if the quadrilateral is a rectangle (you essentially check that ABC is a right triangle). Is the quadrilateral a square?



$$a) d(A, B) = \sqrt{(5-2)^2 + (6-1)^2} = \sqrt{3^2 + 5^2} = \sqrt{34}$$

$$d(B, C) = \sqrt{(0-5)^2 + (9-6)^2} = \sqrt{(-5)^2 + 3^2} = \sqrt{34}$$

$$d(C, D) = \sqrt{(-3-0)^2 + (4-9)^2} = \sqrt{(-3)^2 + (-5)^2} = \sqrt{34}$$

$$d(D, A) = \sqrt{(2-(-3))^2 + (1-4)^2} = \sqrt{5^2 + (-3)^2} = \sqrt{34}$$

$$d(A, C) = \sqrt{(0-2)^2 + (9-1)^2} = \sqrt{(-2)^2 + 8^2} = \sqrt{68}$$

$$b) \sqrt{34}^2 + \sqrt{34}^2 \stackrel{?}{=} \sqrt{68}^2$$

$34 + 34 \stackrel{?}{=} 68$ yes, so ABC is a right triangle,
and $ABCD$ is a rectangle

It is a square because all sides have same length

2. (8pts) Find the equation of the circle if its center is $(-1, 2)$ and contains the point $(2, 3)$. Draw the circle.

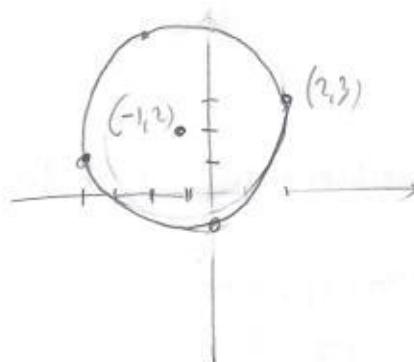
$r = \text{dist. from } (-1, 2) \text{ to } (2, 3)$

$$= \sqrt{(2-(-1))^2 + (3-2)^2} = \sqrt{3^2 + 1^2} = \sqrt{10}$$

Eg. of circle:

$$(x-(-1))^2 + (y-2)^2 = \sqrt{10}^2$$

$$(x+1)^2 + (y-2)^2 = 10$$



3. (8pts) Use the graph of the function f at right to answer the following questions.

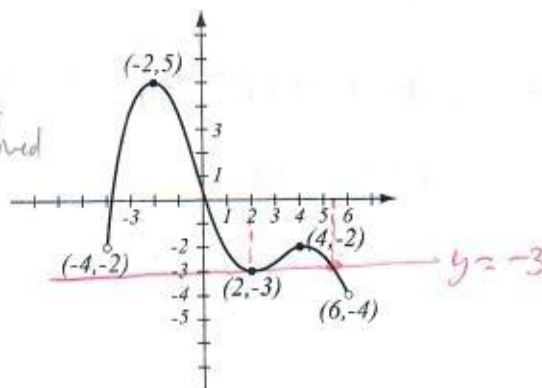
a) Find $f(2)$ and $f(-5)$. $f(2) = -3$, $f(-5)$ not defined

b) What is the domain of f ? $[-4, 6]$

c) What is the range of f ? $[-4, 5]$

d) What are the solutions of the equation $f(x) = -3$?

$$x = 2, 5.4$$

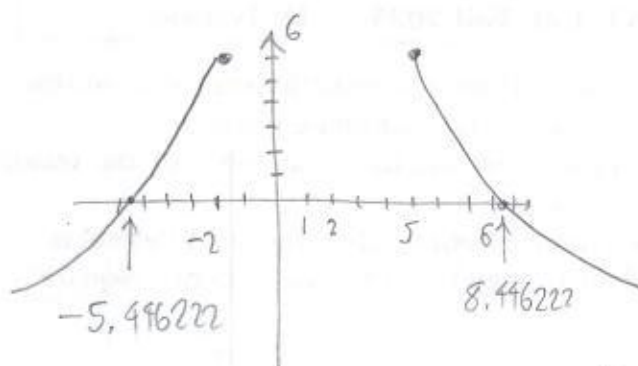


4. (12pts) The function $f(x) = 6 - \sqrt{x^2 - 3x - 10}$ is given.

a) Use your calculator to accurately its graph. Draw the graph here, and indicate units on the axes.

b) Find all the x - and y -intercepts (accuracy: 6 decimal points).

c) State the domain and range.



b) x -int: $-5.446222, 8.446222$
 y -int: DNE

c) domain: $(-\infty, -2] \cup [5, \infty)$
 range: $(-\infty, 6]$

5. (9pts) Find the domain of each function and write it using interval notation.

$$f(x) = \frac{x-3}{4x+1}$$

Can't have $4x+1=0$

$$4x = -1$$

~~then~~ $x = -\frac{1}{4}$

Domain: $(-\infty, -\frac{1}{4}) \cup (-\frac{1}{4}, \infty)$

$$g(x) = \frac{\sqrt{x}}{x^2 - 4x - 21}$$

Must have $x \geq 0$

Can't have $x^2 - 4x - 21 = 0$

$$(x-7)(x+3) = 0$$

$$x = 7, -3$$

~~then~~ $[0, 7) \cup (7, \infty)$

6. (10pts) Let $h(x) = (3x-1)\sqrt{x^2+4x-4}$. Find the following (simplify where appropriate).

$$h(3) = (3 \cdot 3 - 1)\sqrt{3^2 + 4 \cdot 3 - 4}$$

$$= 8\sqrt{17}$$

$$h(0) = (3 \cdot 0 - 1)\sqrt{0^2 + 4 \cdot 0 - 4} = -\sqrt{-4} \quad \text{not defined}$$

$$h(-2t) = (3(-2t) - 1)\sqrt{(-2t)^2 + 4(-2t) - 4}$$

$$= (-6t - 1)\sqrt{4t^2 - 8t - 4}$$

$$h(u-2) = (3(u-2) - 1)\sqrt{(u-2)^2 + 4(u-2) - 4}$$

$$= (3u - 6 - 1)\sqrt{u^2 - 4u + 4 + 4u - 8 - 4}$$

$$= (3u - 7)\sqrt{u^2 - 8}$$