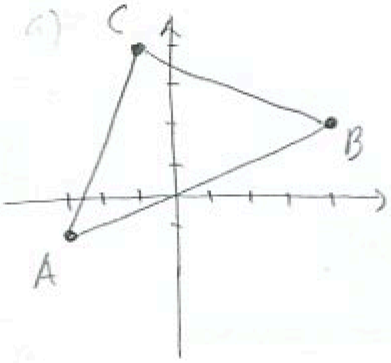
College Algebra — Joysheet 2	**Name:** Saul Ocean
MAT 140, Spring 2025 — D. Ivanšić	*Covers: 1.1, 1.2* *Show all your work!*

1. (11pts) Draw the triangle with vertices $A = (-3, -1)$, $B = (4, 2)$ and $C = (-1, 4)$ in the coordinate plane.
a) Compute the lengths of all sides of the triangle and determine if it is isosceles (two sides with equal length).
b) Determine algebraicallly if the triangle ABC is a right triangle.



a) $d(A,B) = \sqrt{(4-(-3))^2 + (2-(-1))^2} = \sqrt{7^2+3^2} = \sqrt{49+9} = \sqrt{58}$

$d(B,C) = \sqrt{(-1-4)^2 + (4-2)^2} = \sqrt{(-5)^2+2^2} = \sqrt{25+4} = \sqrt{29}$

$d(A,C) = \sqrt{(-1-(-3))^2 + (4-(-1))^2} = \sqrt{2^2+5^2} = \sqrt{4+25} = \sqrt{29}$

since AC and BC have same length, the triangle is isosceles

b) $\sqrt{29}^2 + \sqrt{29}^2 \stackrel{?}{=} \sqrt{58}^2$

$29 + 29 \stackrel{?}{=} 58$ is true, so triangle is a right triangle

2. (10pts) Find the equation of the circle if the endpoints of its diameter are $(3, -2)$ and $(7, 2)$. Draw the circle.

Center = midpoint of $(3,-2),(7,2)$

$= \left(\frac{3+7}{2}, \frac{-2+2}{2}\right) = \left(\frac{10}{2}, \frac{0}{2}\right) = (5,0)$

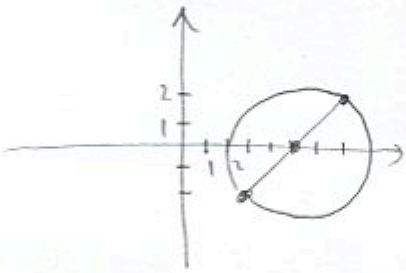
radius = distance from center to $(3,-2)$

$= \sqrt{(3-5)^2 + (-2-0)^2}$

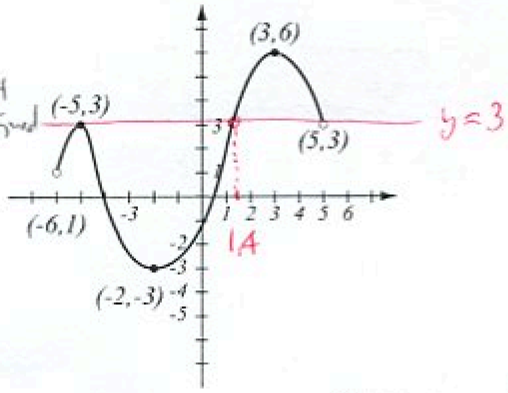
$= \sqrt{(-2)^2+(-2)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$

Eq: $(x-5)^2 + (y-0)^2 = \sqrt{8}^2$

$(x-5)^2 + y^2 = 8$



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? $(-6, 5)$

c) What is the range of f? $[-3, 6]$

d) What are the solutions of the equation $f(x) = 3$? $x = -5, 1.4$

(Note $x=5$ is not a solution, since $f(5)$ is not defined)

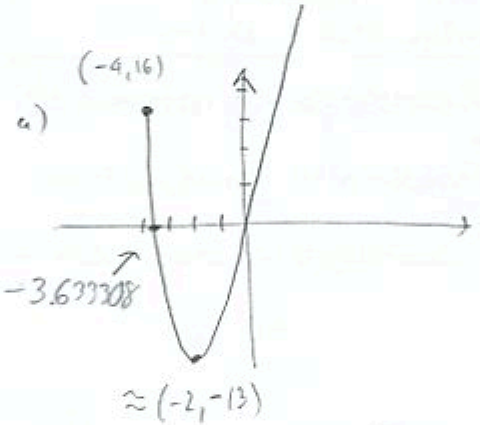
4. (12pts) The function $f(x) = x^2 + 6x\sqrt{x+4}$ is given.

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.

a)



b) y-int: $f(0) = 0 + 6\cdot 0\sqrt{4} = 0$

x-int: $x = 0, -3.633308$

c) Domain = $[-4, \infty)$

Range = $[-13, \infty)$

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

$f(x) = \dfrac{x+4}{x^2-9}$

Can't have $x^2 - 9 = 0$

$x^2 = 9$

$x = \pm 3$

$-3 \quad 3$

$(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

$g(x) = \dfrac{\sqrt{x}}{5-3x}$

Must have $x \geq 0$

Can't have $5 - 3x = 0$

$5 = 3x$

$x = \frac{5}{3}$

$0 \quad \frac{5}{3}$

$[0, \frac{5}{3}) \cup (\frac{5}{3}, \infty)$

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

$h(7) = \dfrac{\sqrt{7-3}}{7^2-7+2} = \dfrac{\sqrt{4}}{49-5} = \dfrac{2}{44} = \dfrac{1}{22}$

$h(1) = \dfrac{\sqrt{1-3}}{1^2-1+2} = \dfrac{\sqrt{-2}}{2}$ ← not defined

$h(4t) = \dfrac{\sqrt{4t-3}}{(4t)^2-4t+2} = \dfrac{\sqrt{4t-3}}{16t^2-4t+2}$

$h(a-1) = \dfrac{\sqrt{a-1-3}}{(a-1)^2-(a-1)+2}$

$= \dfrac{\sqrt{a-4}}{a^2-2a+1-a+1+2} =$

$= \dfrac{\sqrt{a-4}}{a^2-3a+4}$