College Algebra — Joysheet 2 MAT 140, Fall 2023 — D. Ivanšić

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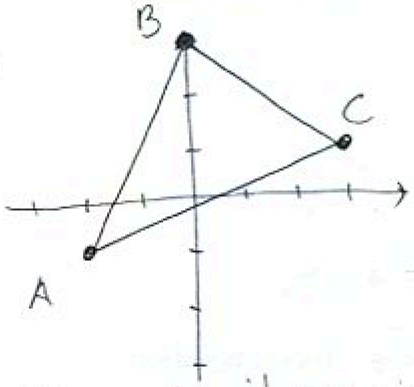
Covers: 1.1, 1.2 *Show all your work!*

1. (13pts) Draw the triangle with vertices $A = (-2, -1)$, $B = (0, 3)$ and $C = (3, 1)$ in the coordinate plane.
a) Does it look like the triangle is a right triangle?
b) Compute the lengths of all sides of the triangle.
c) Use the Pythagorean theorem to determine algebraically whether ABC is a right triangle.

a)



It is possible it is a right triangle

b) $d(A,B) = \sqrt{(0-(-2))^2 + (3-(-1))^2} = \sqrt{2^2+4^2} = \sqrt{20}$

$d(B,C) = \sqrt{(3-0)^2 + (1-3)^2} = \sqrt{3^2+(-2)^2} = \sqrt{13}$

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

c) Need to check $\sqrt{20}^2 + \sqrt{13}^2 \overset{?}{=} \sqrt{29}^2$

$20 + 13 = 29$
is not true, so triangle is not right

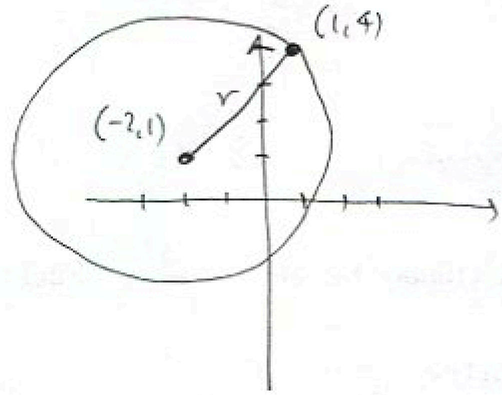
2. (8pts) Find the equation of the circle, if its center is $(-2, 1)$ and the point $(1, 4)$ is on the circle. Draw the circle.

r = distance from $(-2,1)$ to $(1,4)$

$= \sqrt{(1-(-2))^2 + (4-1)^2} = \sqrt{3^2+3^2} = \sqrt{18}$

$(x-(-2))^2 + (y-1)^2 = \sqrt{18}^2$

$(x+2)^2 + (y-1)^2 = 18$
is the equation of the circle



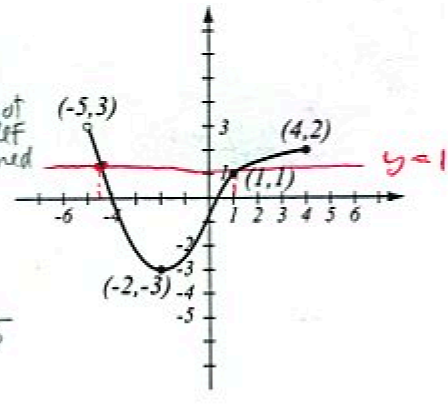
3. (8pts) Use the graph of the function f at right to answer the following questions.

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

b) What is the domain of f? $(-5, 4]$

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

d) What are the solutions of the equation $f(x) = 1$? $x = 1, -4.5$



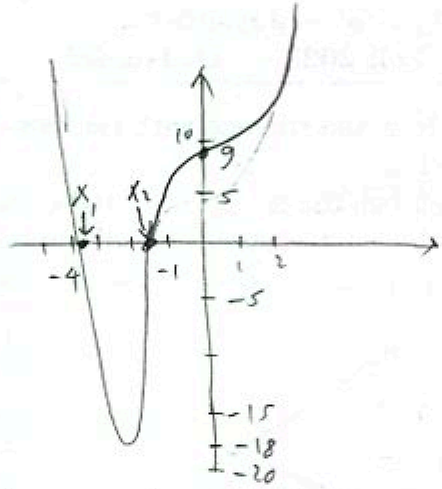
4. (12pts) The function $f(x) = x^4 + 4x^3 + 9$ is given.

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: $f(0) = 9$

x-int: $x_1 = -3.841204$

$x_2 = -1.541114$

c) domain $= (-\infty, \infty)$

range $= [-18, \infty)$

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

$$f(x) = \frac{2x+3}{5x-3}$$

Can't have

$5x - 3 = 0$

$5x = 3$

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

$\frac{3}{5}$

domain $(-\infty, \frac{3}{5}) \cup (\frac{3}{5}, \infty)$

$$g(x) = \sqrt{x} + \frac{1}{x-9}$$

Must have $x \geq 0$

0 9

Can't have $x - 9 = 0$

$x = 9$

domain: $[0, 9) \cup (9, \infty)$

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

$h(1) = \dfrac{1^2}{2\cdot 1 - 1} = \dfrac{1}{1} = 1$

$h(\frac{1}{2}) = \dfrac{(\frac{1}{2})^2}{2\cdot\frac{1}{2} - 1} = \dfrac{\frac{1}{4}}{0}$ not defined

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

$(x+5)(x+5)$

$h(x+5) = \dfrac{(x+5)^2}{2(x+5) - 1} = \dfrac{x^2 + 5x + 5x + 25}{2x + 10 - 1}$

$= \dfrac{x^2 + 10x + 25}{2x + 9}$