College Algebra — Joysheet 2
MAT 140, Fall 2021 — D. Ivanšić

Name: Saul Ocean

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

1. (13pts) Consider the circle with the equation $(x-2)^2 + (y-3)^2 = 10$.
a) Algebraically verify that the points $A = (-1, 2)$, $B = (5, 4)$ and $C = (1, 6)$ are on the circle. Draw the circle in the coordinate plane (may use the points A, B and C to help you).
c) Take any point D on the circle other than A, B and draw the triangle ABD. Does it look like ABD is a right triangle?
d) Because AB is the diameter of the circle, it is a known theorem that ABD is a right triangle for any choice of D. Verify algebraically that ABC is a right triangle.

a) Plug in points in equation.

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

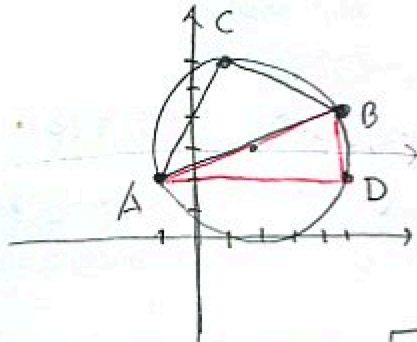
$9 + 1 = 10$ yes

$(5-2)^2 + (4-3)^2 \stackrel{?}{=} 10$

$9 + 1 = 10$ yes

$(1-2)^2 + (6-3)^2 \stackrel{?}{=} 10$

$1 + 9 = 10$ yes



ABD appears to be a right triangle

$d(A,B) = \sqrt{(5-(-1))^2 + (4-2)^2} = \sqrt{6^2+2^2} = \sqrt{40}$

$d(B,C) = \sqrt{(1-5)^2 + (6-4)^2} = \sqrt{(-4)^2+2^2} = \sqrt{20}$

$d(A,C) = \sqrt{(1-(-1))^2 + (6-2)^2} = \sqrt{2^2+4^2} = \sqrt{20}$

$\sqrt{20}^2 + \sqrt{20}^2 \stackrel{?}{=} \sqrt{40}^2$

$20+20 = 40$ $\boxed{\text{yes}}$

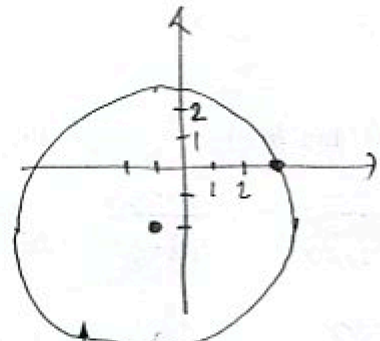
2. (8pts) Find the equation of the circle with center $(-1, -2)$ that contains the point $(0, 3)$. Draw the circle.

r = distance from $(-1,-2)$ to $(0,3)$

$= \sqrt{(0-(-1))^2 + (3-(-2))^2} = \sqrt{1^2+5^2} = \sqrt{26}$

Equation of circle: $(x-(-1))^2 + (y-(-2))^2 = \sqrt{26}^2$

$(x+1)^2 + (y+2)^2 = 26$



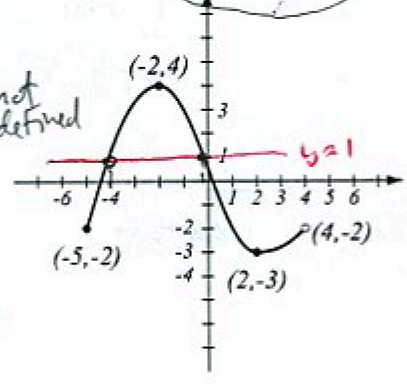
3. (8pts) Use the graph of the function f at right to answer the following questions.

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

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

c) What is the range of f? $[-3, 4]$

d) What are the solutions of the equation $f(x) = 1$? $x = -4, -0.25$

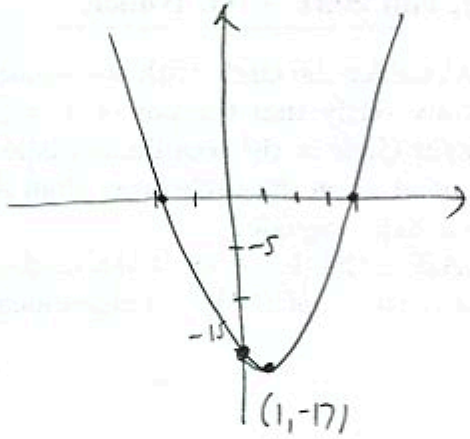


4. (12pts) The function $f(x) = 2x^2 - 4x - 15$ is given.

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) y-int: $f(0) = -15$

x-int: -1.915476, 3.915476

c) domain: $(-\infty, \infty)$ range: $[-17, \infty)$

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

$f(x) = 7 + 3\sqrt{x}$

Must have: $x \geq 0$

0

$[0, \infty)$

$g(x) = \dfrac{4x+7}{x^2 - 12x + 35}$

Can't have $x^2 - 12x + 35 = 0$

$(x-5)(x-7) = 0$

$x = 5, 7$

5 7

$(-\infty, 5) \cup (5, 7) \cup (7, \infty)$

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

$h(7) = \dfrac{7^2 - 3 \cdot 7}{2 \cdot 7 + 6} = \dfrac{49 - 21}{14 + 6} = \dfrac{28}{20} = \dfrac{7}{5}$

$h(-3) = \dfrac{(-3)^2 - 3 \cdot (-3)}{2 \cdot (-3) + 6} = \dfrac{9+9}{-6+6} = \dfrac{18}{0}$ not defined

$h(3a) = \dfrac{(3a)^2 - 3 \cdot 3a}{2 \cdot 3a + 6} = \dfrac{9a^2 - 9a}{6a + 6}$

$= \dfrac{\cancel{3}(3a^2 - 3a)}{\cancel{3}(2a+2)} = \dfrac{3a^2 - 3a}{2a + 2}$

$h(x+4) = \dfrac{(x+4)^2 - 3(x+4)}{2(x+4) + 6}$

$= \dfrac{x^2 + 8x + 16 - 3x - 12}{2x + 8 + 6}$

$= \dfrac{x^2 + 5x + 4}{2x + 14}$