Solutions to Review for Exam I

MATH 1112 sections 54 Spring 2019

Sections Covered in Bittinger: 1.1, 9.1, 1.2, 2.2, 2.3, 2.1 (In Miller: 2.1, 9.1, 2.2, 2.3, 2.8, 2.7)

Calculator Policy: There will be NO calculator use on this exam. You are strongly encouraged to prepare for the exam without relying on a calculator.

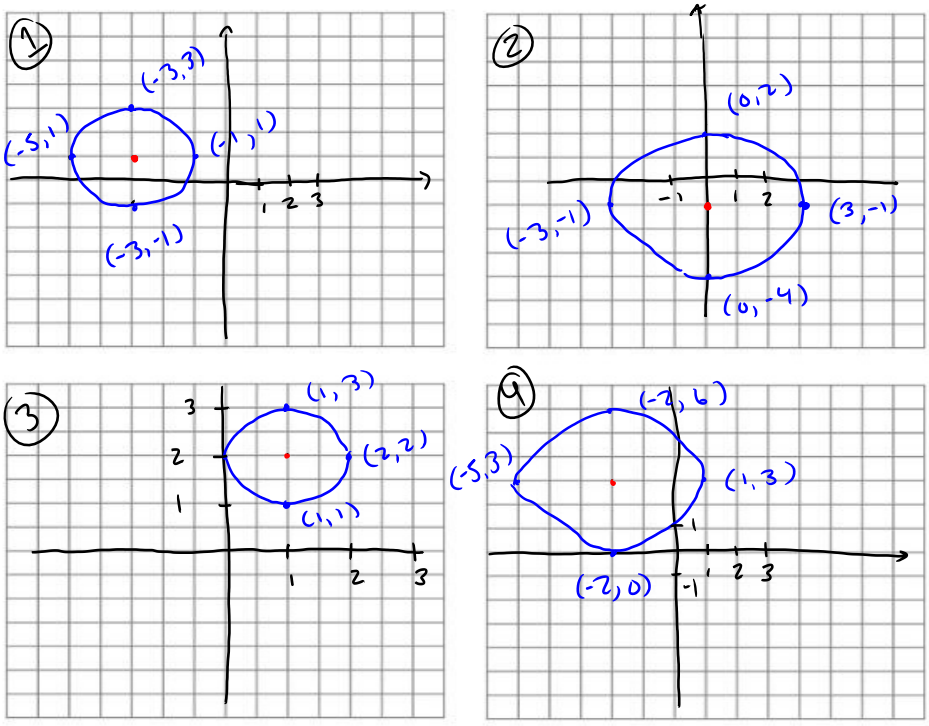
This review is provided as a courtesy to give some idea of what material is covered. Nothing else is intended or implied.

(1) How do you *complete the square*? Come up with your own example to illustrate the process.

I'm not going to put words in your mouth.

(2) Each of the equations defines a circle in the plane. For each one, identify the center and the radius. Produce a plot on the graph paper provided.

1. $(x+3)^2+(y-1)^2=4$ Center $(-3,1)$, radius 2
2. $x^2+y^2+2y=8$ Center $(0,-1)$, radius 3
3. $x^2+y^2-2x-4y+4=0$ Center $(1,2)$, radius 1
4. $x^2+y^2=6y-4x-4$ Center $(-2,3)$, radius 3



(3) For each linear system of equations, determine if the system is consistent independent, consistent dependent, or inconsistent. If consistent, solve the system and give a description of the solution.

(a)
$$\begin{aligned} 3x + 4y &= 1 \\ 2x - y &= 3 \end{aligned}$$

(b)
$$\begin{aligned} 2x + 2y &= 7 \\ 3x &= 14 - 3y \end{aligned}$$

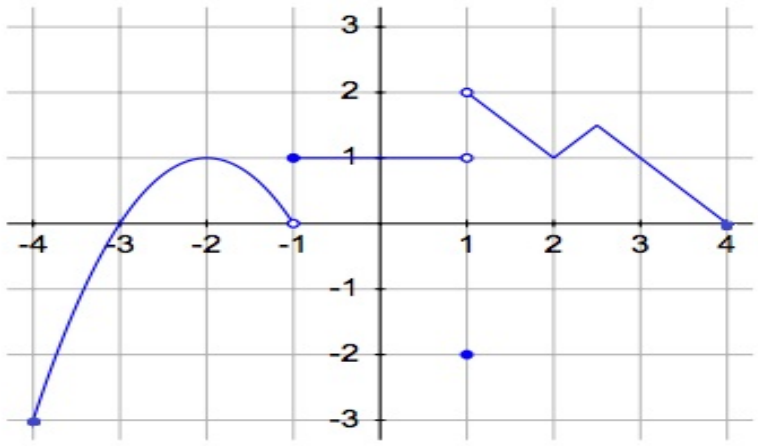
(c)
$$\begin{aligned} -2x - 7y &= 6 \\ x - 3y &= -2 \end{aligned}$$

(d)
$$\begin{aligned} 3x - 2y &= 5 \\ 4y &= 6x - 10 \end{aligned}$$

(a) Consistent independent $x = \frac{13}{11}$, $y = -\frac{7}{11}$; (b) inconsistent; (c) consistent independent $x = -\frac{32}{13}$, $y = -\frac{2}{13}$; (d) consistent dependent, all solutions live on the line $y = \frac{1}{2}(3x - 5)$

(4) Aaron's boat travels 45 miles downstream in 3 hours. The return trip upstream takes 5 hours. Find the speed of the boat in still water, and the speed of the current. (Hint: Create a linear system in two variables. For example, let x be the speed of the boat in still water and y be the speed of the current. When traveling downstream, the speed is $x + y$, and traveling upstream it is $x - y$. Recall that distance = rate times time. Both trips are the same 45 mile distance.) The equations to solve are $45 = 3(x + y)$ and $45 = 5(x - y)$. The still water speed of the boat $x = 12$ mph, and the speed of the current $y = 3$ mph.

(5) Use the graph of $y = f(x)$ shown to answer the following questions.



1. Evaluate $f(-1) = 1$

2. On which intervals is f increasing? $(-4,-2)$ and $(2,5/2)$

3. Evaluate $f(1) = -2$

4. Find all solutions of the equation $f(x) = 0$. There are two solutions, -3 and 4.

5. How many solutions are there to the equation $f(x) = \frac{1}{2}$? There appear to be three, one between -3 and -2, another between -2 and -1, and a third between 3 and 4.

6. Identify an interval over which f is constant. The largest is $(-1,1)$.

7. Evaluate $f(f(-3))$. How about $f(f(f(-3))$? $f(f(-3)) = f(0) = 1$ and $f(f(f(-3)) = f(f(0)) = f(1) = -2$

(6) Find the domain of each function. Express the answer using interval notation.

(a) $f(x) = \dfrac{1}{x^2-4}$ $(-\infty,-2)\cup(-2,2)\cup(2,\infty)$

(b) $H(t) = \sqrt{1-|t|}$ $[-1,1]$

(c) $g(v) = \dfrac{1}{v^2+3}$ $(-\infty,\infty)$

(7) Let $f(x) = 2x^2 - 3x$. Evaluate each of the following.

1. $f(2)$ $= 2$

2. $f(-2)$ $= 14$

3. $f(r)$ $= 2r^2 - 3r$

4. $f(4r)$ $= 32r^2 - 12r$

5. $f(x+h)$ $= 2x^2 + 4xh + 2h^2 - 3x - 3h$

6. $f(x+h) - f(x)$ $= 4xh + 2h^2 - 3h$

7. $\dfrac{f(x+h)-f(x)}{h}$ $= 4x + 2h - 3$

(8) Consider the functions

$$f(x) = \sqrt{x^2+1}, \qquad g(x) = \frac{1}{x-1,} \qquad \text{and} \qquad h(x) = 3x^2$$

Evaluate each expression. Simplify if possible.

1. $(f+g)(0)$ $= 0$
2. $\left(\dfrac{h}{f}\right)(1)$ $= \dfrac{3}{\sqrt{2}}$
3. $(hg)(2)$ $= 12$
4. $(f \circ g)(0)$ $= \sqrt{2}$
5. $(g \circ f)(0)$ $=$ undefined
6. $(h \circ f)(2)$ $= 15$
7. $(f \circ f)(1)$ $= \sqrt{3}$
8. $(f \circ g)(x)$ $= \sqrt{\dfrac{x^2-2x+2}{(x-1)^2}}$
9. $(h \circ g)(x)$ $= \dfrac{3}{(x-1)^2}$