DEPARTMENT OF MATHEMATICS

Ma 110 Second Exam October 24, 2008

DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO.

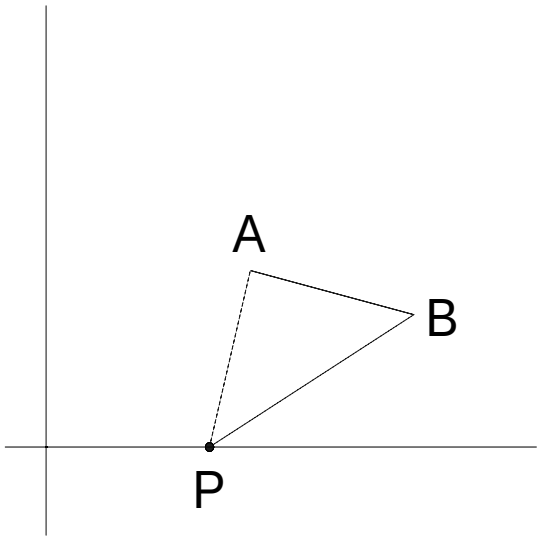
Instructions: Be sure your name, section number, and student ID are filled in below. Cell phones must be OFF and put away before you open this exam. You may use calculators (including graphing calculators, but no laptops or cellphone calculators) for checking numerical calculations. However, you must show your work to receive credit.
Put your answers in the answer boxes provided, and show your work.
If your answer is not in the box or if you have no work to support your answer, you will receive no credit.
The test has been carefully checked and its notation is consistent with the homework problems. No additional details will be provided during the exam.

Problem	Maximum Score	Actual Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
Homework	10	
Total	100	

Please fill in the information below.

NAME: _____ **Section:** _____
Last four digits of Student ID: _____

1.



The coordinates of the point A are $(5, 4)$ and those of the point B are $(9, 3)$.

What are the coordinates of the point which is on the x-axis and such that the triangle PAB is a right triangle with the right angle at the point A?

Answer $P =$

2. a) Find all the points $P(x, y)$ on the y-axis which are $\sqrt{29}$ units away from the point $A(-5, -8)$.

The y-coordinates of the points are:

Answer(s):

Let L be the line $-8\,x - 5\,y - 3 = 0$.

b) A line parallel to L and passing through the point $M\,(-6, 6)$ is given by

$$\_\_\_\_\_x + \_\_\_\_\_y + \_\_\_\_\_ = 0$$

b) A line perpendicular to L and passing through the point $M\,(-6, 6)$ is given by

$$\_\_\_\_\_x + \_\_\_\_\_y + \_\_\_\_\_ = 0$$

3. Assume that you are given a coordinate change on a line which changes the coordinate x to a new coordinate z given by the formula

   $z = Ux + P$

   where U , P are real numbers with U non zero.

   a) If the new coordinate of the point with x-coordinate -2 is 27 and the new coordinate of the point with x-coordinate 4 is -33 , then we must have

$U =$

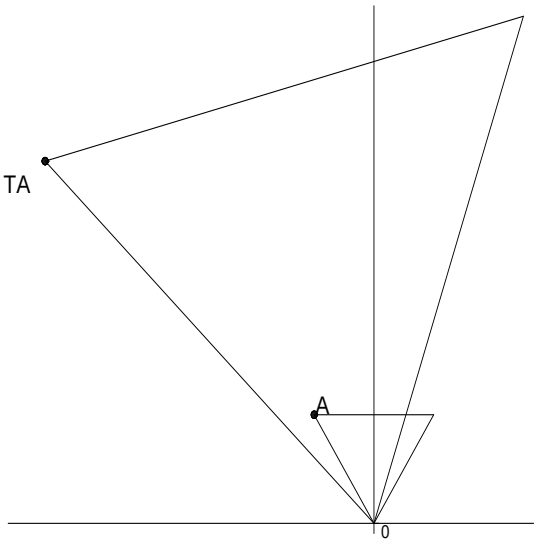
   and

$P =$

   b) Moreover, for the same transformation, if the new z coordinate is 7 , then the original coordinate must have been

Answer:

4.



The transformation T maps the plane onto itself by multiplication by a complex number. That is, there is a complex number $C = a + ib$ such that any point $P\,(x, y)$ has image $T(P)$ as the point corresponding to the complex number CP .

For a particular complex number C the transformation T takes the smaller triangle in the diagram to the larger one. The point $A\,(-1, 1.5)$ (the upper left vertex) on the smaller triangle is taken to the point $T\,(A)$ =$(-11/2, 5)$ on the larger triangle.

a) The complex number C must be equal to:

b) The small triangle is rotated by _____ degrees counterclockwise and expanded by a factor of _____

5. a) Parametric equations for the line joining $A(6, 2)$ and $B(3, -5)$ for which the parameter t has value 0 at A and value 1 at B, must be:

$x =$	and	$y =$

Moreover, the point $C(27/5, 3/5)$ must correspond to $t =$ _____

c) Finally, the point D outside the segment AB such that:

the distance $d(A, D)$ is 2 times the distance $d(B, D)$

corresponds to $t =$ _____

and has the coordinates $x =$ _____and $y =$ _____

6. Suppose we have (x, y) and (z, w) coordinates for points in the plane. If the formulas

$$\{z = -x + 7 \quad w = y + 8\}$$

define the transformation from (x, y) to (z, w) coordinates, then the formulas defining the reverse transformation from (z, w) to (x, y) coordinates are:

$x =$	and	$y =$

7. Consider the parametric line:

$$x = 3\,t + 1, y = t + 1$$

Determine the slope-intercept equation for the same line.

Answer: $y =$

8. Consider two parametric lines:

$$\text{Line 1:} x = 2\,t + 2, y = -3\,t + 1$$

$$\text{and Line 2:} x = 3\,s + 3, y = -s + 1$$

Let $P(x, y)$ be their common point.

Then the x-coordinated of P is

and its y-coordinate is

9. a) The quadratic function $f(x) = (x-6)(x+7)$ has an absolute extremum at the point where

$x =$ ☐

b) This extremum value of $f(x)$ is ☐

The above extremum value is an absolute **(maximum),(minimum)** (circle one and explain).

c) The graph of $y = f(x)$ opens **(upward),(downward)** (circle one and explain).

d) The values of x for which f(x) is negative are given by the interval ☐ Explain.

1 Answer Key for ex2f08_v1

1. ◇ $P = [4, 0]$

2. ◇ a) $[-10, -6]$ b) $-8\,x - 5\,y - 18 = 0$ c) $-5\,x + 8\,y - 78 = 0$

3. ◇ -10 7 0

4. ◇ a) $4 + i$ b) $[14.03624346, \sqrt{17} = 4.123105626]$

5. ◇ a) $[-3\,t + 6, -7\,t + 2]$ b) 1/5 c) $2 = 2.0$ $[0, -12]$

6. ◇ $x = -z + 7$ $y = w - 8$

7. ◇ $y = 1/3\,x + 2/3$

8. ◇ $x = \frac{12}{7}$ $y = \frac{10}{7}$

9. ◇ (a) $-1/2$ (b) $-\frac{169}{4}$ is the minimum(c)upward(d) $[-7, 6]$