Name: Solution Key PID: _____

MATH 2: Midterm 2

Summer 2017

Instructions:

(1) Write your name and PID on the front of the exam.
(2) No calculators or other electronic devices are allowed during this exam.
(3) Read each question carefully, and answer each question completely.
(4) Show all of your work. No credit will be given for unsupported answers.

1	/10
2	/10
3	/10
4	/10
5	/10
Extra	/3
$\sum$	/50

Problem 1 (10 points)

a) Find the equation of the line containing $(4, 1)$ and $(7, -2)$.

Slope $= m = \frac{-2-1}{7-4} = \frac{-3}{3} = -1$

use "point-slope" formula: $y - y_1 = m(x_1 - x_1)$

$y - 1 = -1(x - 4)$

$y - 1 = -x + 4$

$\boxed{y = -x + 5}$

b) Find the equation of the line containing $(1, 2)$, perpendicular to the line whose equation is given by:

$$y = -\frac{1}{3}x + \sqrt{37}$$

perpendicular $\Rightarrow m_1 m_2 = -1$

$\Rightarrow -\frac{1}{3} \cdot m_2 = -1$

$m_2 = 3$

again, point-slope formula

$y - 2 = 3(x - 1)$

$y - 2 = 3x - 3$

$\boxed{y = 3x - 1}$

c) Find t such that the point $(t, 2t)$ is on the line $y = -x + 9$

$(t, 2t)$ on $y = -x + 9$ means

if $x = t$, $y = 2t$, then $y = -x + 9$ is satisfied.

$\Rightarrow (2t) = -t + 9$

$3t = 9$

$\boxed{t = 3}$

Problem 2 (10 points)

Let $f(x) = \sqrt{x-4} - 5$

a) Find the domain of f

need $x - 4 \geq 0$

$x \geq 4$

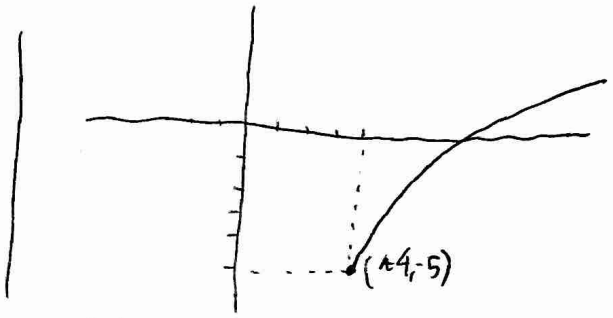
Domain = $[4, \infty)$

b) Draw the graph of f

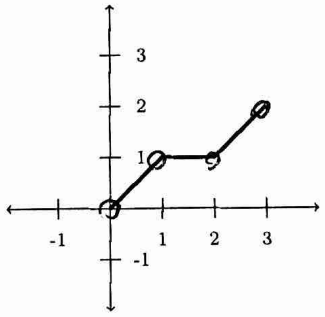
$g(x) = \sqrt{x}$

$f(x) = g(x-4) - 5$

n k



c) Suppose the graph of $g(x)$ is given below:



Find $g(0), g(1), g(2)$ and $g(3)$.

$g(0) = 0$

$g(1) = 1$

$g(2) = 1$

$g(3) = 2$

Problem 3 (10 points):
Find all intersection points between two graphs whose equations are given below:

$$y - x = 1$$
$$xy - 4x = 4$$

Solve for y: $y - x = 1$

$y = 1 + x$

Solve for y: $xy - 4x = 4$

$xy = 4 + 4x$

$y = \frac{4+4x}{x}$

$\Rightarrow$ $1 + x = \frac{4+4x}{x}$

$x + x^2 = 4 + 4x$

$x^2 - 3x - 4 = 0$

$(x-4)(x+1) = 0$

$\Rightarrow$ $x = 4$ or $x = -1$

if $x = 4$, then

$y = 1 + x$

$y = 1 + 4$

$= 5$

(4,5) is one of the solution

if $x = -1$, then

$y = 1 + x$

$y = 1 + (-1)$

$= 0$

(-1,0) is the other solution.

Problem 4 (10 points)

a) Solve for x:

$$ax^2 - 3ax - 2bx + 6b = 0$$

$$ax(x-3) - 2b(x-3) = 0$$

$$(x-3)(ax-2b) = 0$$

$$\Rightarrow \quad x-3 = 0 \quad \text{or} \quad ax-2b = 0$$

$$\boxed{x = 3 \quad \text{or} \quad x = \frac{2b}{a}}$$

b) Simplify the following expression as much as possible:

$$\frac{x^2-7}{x+\sqrt{7}}$$

multiply both numerator & denominator by the conjugate of $x+\sqrt{7}$, which is $x-\sqrt{7}$

$$\Rightarrow \quad \frac{x^2-7}{x+\sqrt{7}} = \frac{(x^2-7)\cdot(x-\sqrt{7})}{(x+\sqrt{7})\cdot(x-\sqrt{7})} = \frac{(x^2-7)(x-\sqrt{7})}{x^2-7}$$

$$= \boxed{x-\sqrt{7}}$$

Problem 5 (10 points)

a) Convert $\frac{3\pi}{4}$ radians to degrees.

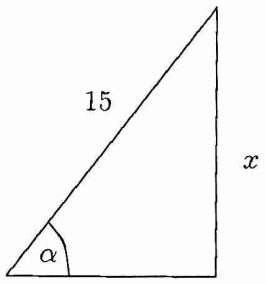
$\frac{3\pi}{4}$ rads $= \frac{3\pi}{4} \cdot \frac{360^\circ}{2\pi}$ deg $= 3 \cdot 45$ deg

$= \boxed{135^\circ}$

b) Compute $\sin\left(\frac{\pi}{6}\right)$ and $\cos\left(\frac{\pi}{2}\right)$.

$\boxed{\sin\left(\frac{\pi}{6}\right) = \frac{1}{2} \quad , \cos\left(\frac{\pi}{2}\right) = 0}$

c) Suppose α is the angle such that $\sin(\alpha) = \frac{4}{5}$. Find the length x from the diagram below:



$\sin\alpha = \frac{4}{5}$

$\frac{x}{15} = \frac{4}{5} \Rightarrow \boxed{x = 12}$