

**Exam 1**  
**Chapters P and 1**

Answer the following questions. *Answers without proper evidence of knowledge will not be given credit.* Make sure to make reasonable simplifications. Do not approximate answers. Give exact answers. **No calculators are allowed on this exam.**

**True or False** (3 points each)

F 1.  $\sqrt{4+4} = \sqrt{4} + \sqrt{4}$

T 2.  $(a \cdot b)^2 = a^2 \cdot b^2$

F 3.  $(5+7)^2 = 5^2 + 7^2$

T 4.  $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$

F 5.  $\frac{a}{b} + \frac{c}{d} = \frac{a+c}{b+d}$  ← This is same question!

F 6.  $\frac{x+4}{x-4} + \frac{x+5}{x+4} = \frac{(x+4)+(x+5)}{(x-4)+(x+4)}$

T 7. If the quadratic equation  $ax^2 + bx + c = 0$  has a negative **discriminant** then there are no solution

T 8.  $(x^4)^2 = (x^2)^4$

**Show your work!**

1. (9 points)

Which of these is a representation of the line  $y - 3 = \frac{1}{3}(x - 4)$ ? (Mark all that apply and explain your reasoning.)

(a)  $y = \frac{1}{3}x + 3$  (b) The line determine by the two points  $(0, \frac{13}{3}), (-13, 0)$  (c) c

(a) NO!

$$y - 3 = \frac{1}{3}(x - 4)$$

$$y - 3 = \frac{1}{3}x - \frac{4}{3}$$

$$y = \frac{1}{3}x + \frac{5}{3}$$

(b) NO!

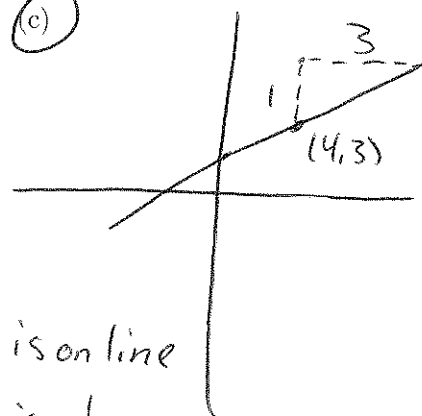
$$\frac{13}{3} - 3 \neq \frac{1}{3}(0 - 4)$$

$$\frac{4}{3} \neq -\frac{4}{3}$$

(c) Yes!

$(4, 3)$  is on line

slope is  $\frac{1}{3}$ .



2. Consider the rational expression  $\frac{(x^2+8x+15)}{(x^2-9)(x^2-3x-10)}$ .

- a) Find the domain of the above rational expression. (8 points)  
 b) Simplify the above rational expression and put it into lowest terms. (4 points)

a)  $(x^2-9)(x^2-3x-10) = (x-3)(x+3)(x-5)(x+2)$

denominator is 0 when  $x = \pm 3, 5, -2$ .

Since we cannot divide by zero

$$\text{Dom} = \{x \in \mathbb{R} : x \neq \pm 3, 5, -2\}$$

$$= (-\infty, -3) \cup (-3, -2) \cup (-2, 3) \cup (3, 5) \cup (5, \infty)$$

b)  $\frac{(x^2+8x+15)}{(x^2-9)(x^2-3x-10)} = \frac{\cancel{(x+3)}(x+5)}{\cancel{(x+3)}(x-3)(x-5)(x+2)} = \frac{(x+5)}{(x-3)(x-5)(x+2)}$

3. Boudreaux is going out fishing on this beautiful sunny day we are having. So he takes his canoe out and the strong tide makes his trip down river 4 mph faster than his trip back up the river at the end of the day. If it takes him 10 min (1/6 hour) to get down to his fishing spot and 30 min (1/2 hour) to get back up then how far away is Boudreaux's fishing spot? (10 points)

	Rate	Time	Distance
downriver	$x+4$	$\frac{1}{6}$	$\frac{1}{6}(x+4)$
upriver	$x$	$\frac{1}{2}$	$\frac{1}{2}x$

$$\frac{1}{6}(x+4) = \frac{1}{2}x$$

$$\frac{1}{6}x + \frac{2}{3} = \frac{1}{2}x$$

$$\frac{2}{3} = \frac{1}{3}x$$

$$x = 2 \text{ mph}$$

So distance =  $\frac{1}{2}x = \frac{1}{2}(2) = 1 \text{ mile}$ .

4. Find all solutions to the following absolute value equations.

a)  $|x| = 3$  (3 points)

b)  $5|3x + 2| - 4 = 6$  (7 points)

a)  $|x| = 3$  then  $x = \pm 3$

b)  $5|3x+2|-4=6$   
 $5|3x+2|=10$   
 $|3x+2|=2$

$3x+2=2$  or  $3x+2=-2$   
 $3x=0$  or  $3x=-4$   
 $x=0$  or  $x=-\frac{4}{3}$

$x = 0, -\frac{4}{3}$

5. Solve the following equation of quadratic type  $(u^2 + 2u)^2 - 2(u^2 + 2u) - 3 = 0$ .

a) Substitute  $x$  in for the correct expression of  $u$ . (2 points)

b) Solve the quadratic equation you get for  $x$ . (5 points)

c) Given your solutions from b), solve the equation of quadratic type in terms of  $u$ . (5 points)

a) Let  $x = u^2 + 2u$ .

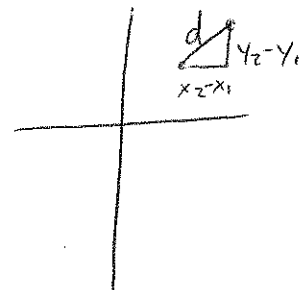
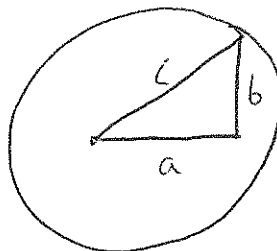
b)  $x^2 - 2x - 3 = 0$   
 $(x-3)(x+1) = 0$   
 $x = 3, -1$

c)  $x = +3$   $3 = u^2 + 2u$  or  $x = -1$   $-1 = u^2 + 2u$   
 $u^2 + 2u - 3 = 0$   $u^2 + 2u + 1 = 0$   
 $(u+3)(u-1) = 0$   $(u+1)^2 = 0$   
 $u = -3, 1$   $u = -1$

So  $u = \pm 1, -3$

6. The Pythagorean Theorem can be used to do which of the following: (3 points)

- a) Find the hypotenuse of a triangle
- b) Find the radius of a circle
- c) Determine distance in the plane
- d) All of the above



7. Find the distance between each given pair of points.

- a) (4,3) and (0,0) (5 points)
- b) (2,6) and (-3,-6) (5 points)

$$a) \sqrt{(4-0)^2 + (3-0)^2} = \sqrt{16+9} = 5$$

$$b) \sqrt{(2-(-3))^2 + (6-(-6))^2} = \sqrt{25+144} = 13$$

8. Let  $l_1$  be the line defined by the equation  $4y - \frac{16}{3} = 12x$ . Find the line perpendicular to  $l_1$  which goes through the origin (i.e. the point (0,0)). Write your final answer in **slope-intercept** form. (10 points)

First find slope-intercept of  $l_1$

$$4y - \frac{16}{3} = 12x$$

$$4y = 12x + \frac{16}{3}$$

$$y = 3x + \frac{4}{3}$$

Perpendicular line has slope  $-\frac{1}{3}$ .

Point-slope form  $(y-0) = -\frac{1}{3}(x-0)$

$$y = -\frac{1}{3}x.$$

**Extra Credit Problem:** Write the following equation of a circle in standard form  $x^2 + 10x + y^2 - 8y = -40$ . (5 points)

$$x^2 + 10x + \underline{\quad} + y^2 - 8y + \underline{\quad} = -40$$

$$x^2 + 10x + \underline{\left(\frac{10}{2}\right)^2} + y^2 - 8y + \underline{\left(\frac{-8}{2}\right)^2} = -40 + \left(\frac{10}{2}\right)^2 + \left(\frac{-8}{2}\right)^2$$

$$x^2 + 10x + 25 + y^2 - 8y + 16 = -40 + 25 + 16$$

$$(x+5)^2 + (y-4)^2 = 1$$

