

**Math 4**  
Exam 1  
September 3, 1997

Name Key

Instructor \_\_\_\_\_  
Class Time \_\_\_\_\_

Show your work.

1. Solve for  $x$

(4) a)  $\frac{1}{x-2} + \frac{3}{x+3} = \frac{4}{x^2+x-6}$

~~$x \neq 2$~~   ~~$x \neq -3$~~   $\frac{x+3 + 3(x-2)}{(x-2)(x+3)} = \frac{4}{x^2+x-6}$

$x+3+3x-6 = 4$   
 $4x-3 = 4 \quad x = \frac{7}{4}$

2. Solve for  $r$  (Answer must be in simplest fractional form.)

(8)  $s = \frac{rL-a}{r-1}$

$s(r-1) = rL-a$   
 $sr - s = rL - a$   
 $sr - rL = s - a$   
 $r(s-L) = s - a$

$r = \frac{s-a}{s-L}$

$r = \frac{s-a}{s-L}$

3. Solve for  $x$  by factoring (Show work for credit.)

(8)  $x^2+9=10x$

$x^2-10x+9=0$

$(x-9)(x-1)=0$

$x=9$  or  $1$

$x = \underline{9, 1}$

4. Solve by completing the square. (Show work.) Answer must be in simplest radical form or simplest  $a+bi$  form)

(8)  $4x^2-4x-99=0$

$4x^2-4x = 99$

$4(x^2-x) = 99$

$4(x^2-x+\frac{1}{4}) = 99+1$

$4(x-\frac{1}{2})^2 = 100$

$(x-\frac{1}{2})^2 = 25$

$x - \frac{1}{2} = \pm 5$

$x = \frac{1}{2} \pm 5$

$x = 5\frac{1}{2}$  or  $-4\frac{1}{2}$

$x = \frac{5\frac{1}{2} \text{ or } -4\frac{1}{2}}{(\frac{11}{2} \text{ or } -\frac{9}{2})}$

(4) b)  $|x-10| = x^2-10x$

$x-10 = x^2-10x$

$0 = x^2-11x+10$

$(x-10)(x-1) = 0$

$x = 10, 1$   
ck in prob.

a)  $x = \frac{7}{4}$

b)  $x = \underline{10, -1}$

or  $-(x-10) = x^2-10x$   
 $-x+10 = x^2-10x$   
 $0 = x^2-9x-10$   
 $= (x+1)(x-10)$   
 $x = 10, -1$   
ck

5. Solve by quadratic formula (Answer must be in simplest radical form, simplest  $a+bi$  form, or simplest fractional form.)

(6)  $5x^2 + 6x + 3 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-6 \pm \sqrt{36 - 4(5)(3)}}{2(5)}$$

$$x = \frac{-6 \pm \sqrt{-24}}{10}$$

$$= \frac{-6 \pm 2i\sqrt{6}}{10}$$

$$= \frac{2(-3 \pm i\sqrt{6})}{5}$$

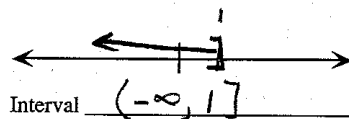
$$x = -\frac{3}{5} \pm \frac{\sqrt{6}}{5}i$$

6. Solve the following inequalities. Graph the solution and write your answer using interval notation.

(5) a.  $6x - 4 \leq 2$

$$6x \leq 6$$

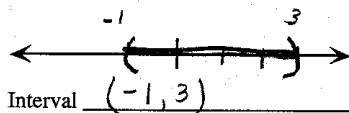
$$x \leq 1$$



(5) b.  $1 < 2x + 3 < 9$

$$-2 < 2x < 6$$

$$-1 < x < 3$$



(5) c.  $|x - 4| > 2$

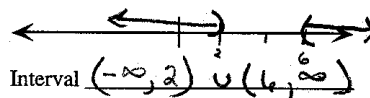
$$x - 4 > 2$$

$$x > 6$$

$$\text{or } -(x - 4) > 2$$

$$x - 4 < -2$$

$$x < 2$$



(5) d.  $\frac{x+12}{x+2} \geq 3$

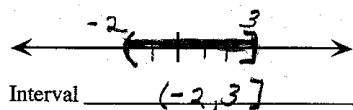
$$\frac{x+12}{x+2} - 3 \geq 0$$

$$\frac{x+12 - 3(x+2)}{x+2} \geq 0$$

$$\frac{x+12 - 3x - 6}{x+2} \geq 0$$

$$\frac{-2x + 6}{x+2} \geq 0$$

critical # -2, 3 - where num = 0 or denom = 0.



7. Perform the operation and write the result in standard  $(a+bi)$  form

$$(5) \quad \frac{(2-3i)(5i)}{2+3i} = \frac{10i - 15i^2}{2+3i} = \frac{10i + 15}{2+3i} \cdot \frac{2-3i}{2-3i} = \frac{20i + 30 - 30i^2 - 45i}{4-9(i^2)}$$

$$= \frac{-25i + 60}{13}$$

Std. Form  $\underline{\underline{\frac{60}{13} - \frac{25}{13}i}}$

8. Solve for  $x$ .

(5)  $x^4 + 2x^3 - 8x - 16 = 0$

$$x^3(x+2) - 8(x+2) = 0$$

$$(x+2)(x^3 - 8) = 0$$

$$(x+2)(x-2)(x^2 + 2x + 4) = 0$$

$$x = -2, 2, -1 \pm i\sqrt{3}$$

quadratic formula

$$\frac{-2 \pm \sqrt{4-16}}{2} = \frac{-2 \pm \sqrt{-12}}{2}$$

$$x = \underline{\underline{\pm 2, -1 \pm i\sqrt{3}}}$$

9. Solve for  $x$ .

(7)  $\sqrt{2x+7} - x = 2$

$$\sqrt{2x+7} = 2+x$$

$$2x+7 = 4+4x+x^2$$

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

$$0 = (x+3)(x-1)$$

$$x = -3 \text{ or } 1 \text{ ok}$$

$$\sqrt{2(-3)+7} - (-3) = 2$$

$$\sqrt{1+7} = 2 \text{ no}$$

$$\sqrt{2(1)+7} - 1 = 2$$

$$\sqrt{9} - 1 = 2 \text{ ok}$$

$$x = \underline{\underline{1}}$$

10. You commute 56 miles one way to work. The trip to work takes 10 minutes longer than the trip home.

(7) Your average speed on the trip home is 8 miles per hour faster. What is your average speed on the trip home?

$$RT = D$$

$$D = 56 \text{ mi}$$

$$R_T T_T = 56 \Rightarrow T_T = \frac{56}{R_T}$$

$$R_H T_H = 56 \Rightarrow (R_T + 8) \left( \frac{56}{R_T} - \frac{1}{6} \right) = 56 \quad (\text{mult by } 6R_T)$$

$$(R_T + 8)(336 - R_T) = 336R_T$$

$$336R_T - R_T^2 + 2688 - 8R_T = 336R_T$$

$$R_T^2 + 8R_T - 2688 = 0$$

$$R_T = 48$$

$$R_H = 48 + 8 = \boxed{56 \text{ mph}}$$

$$\begin{array}{c} T_T \quad R_T \\ \text{---} \text{---} \text{---} \\ T_H = T_T - 10 \text{ min} = T_T - \frac{1}{6} \text{ hr} \end{array}$$

$$R_H = R_T + 8 \text{ mph}$$

$$\frac{56}{T_H} = \frac{56}{R_T} - \frac{1}{6}$$

same D.

11. Find the standard form of the equation of the specified circle: endpoints of a diameter are  $(-4, -1)$ ,  $(4, 1)$ .

(6) mdpt  $\left(\frac{x_2+x_1}{2}, \frac{y_2+y_1}{2}\right)$   
 $= \left(\frac{0}{2}, \frac{0}{2}\right) = (0, 0)$  center

$$d = \sqrt{(-4-4)^2 + (-1-1)^2}$$

$$= \sqrt{64+4} = \sqrt{68}$$

$$= 2\sqrt{17} \text{ diameter}$$

$$r = \sqrt{17}$$

So  $(x-0)^2 + (y-0)^2 = (\sqrt{17})^2$   
 $x^2 + y^2 = 17$

In exercises 12-17 match the equation with its graph. Place the correct letter in the blank. [The graphs are labeled (a), (b), (c), (d), (e), and (f).] (2 pts ea)

12.  $y = 1 - x$      c    

13.  $y = x^2 - 2x$      a    

14.  $y = \sqrt{9 - x^2}$      f    

15.  $y = 2\sqrt{x}$      e    

16.  $y = x^3 - x + 1$      b    

17.  $y = |x| - 3$      d    

