Math 172 – Quasi-Assignment #7 **Do not hand in! Will not be marked!**

1. Solve by factoring.

$a^2 - 121 = 0$

$(a-11)(a+11)=0$

$a = 11 \quad a = -11$

$\{\pm 11\}$

2. Solve using the even-root properly.

$2x^2 = 3$

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

$x = \pm\sqrt{\frac{3}{2}}$

$x = \pm\sqrt{\frac{6}{4}}$

$x = \pm\frac{\sqrt{6}}{2}$

$\left\{\pm\frac{\sqrt{6}}{2}\right\}$

3. Solve by completing the square.

$2x^2 - x = 6$

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

$\left(-\frac{1}{4}\right)^2 = \frac{1}{16}$

$x^2 - \frac{1}{2}x + \frac{1}{16} = 3 + \frac{1}{16}$

$(x-\frac{1}{4})^2 = \frac{49}{16}$

$x - \frac{1}{4} = \pm\frac{7}{4}$

$x = \frac{1}{4} \pm \frac{7}{4}$

$x = 2, \; x = -\frac{3}{2}$

$\left\{2, -\frac{3}{2}\right\}$

4. Solve using the quadratic formula.

$2x^2 + 3x - 1 = 0$

$x = \frac{-3 \pm \sqrt{9 - 4(2)(-1)}}{2 \cdot 2}$

$x = \frac{-3 \pm \sqrt{17}}{4}$

$\left\{\frac{-3 \pm \sqrt{17}}{4}\right\}$

5. For the two equations below, find the value of the discriminant and state the number of real solutions to each equation. Don't bother to solve them!

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

discriminant: -95

# of real solns: 0

$b^2-4ac = (-1)^2 - 4(3)(8)$
$= 1 - 96$
$= -95$

$y^2 - y + \frac{1}{4} = 0$

discriminant: 0

# of real solns: 1

$b^2-4ac = (-1)^2 - 4(1)(\frac{1}{4})$
$= 0$

6. Use the discriminant to determine whether the following quadratic can be factored, and state whether the quadratic is prime.

$6x^2 - 7x - 4$

discriminant: 145

prime? yes

$b^2-4ac = (-7)^2 - 4(6)(-4)$
$= 49 + 96$
$= 145$
not a perfect square

7. Find the complex solutions to the following equation.

$x^2 + x + 1 = 0$

$\{\frac{-1 \pm i\sqrt{3}}{2}\}$

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

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

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

8. Find all solutions to the following equation.

$\frac{x^4}{3} = x^2 + 6$

$x^4 = 3x^2 + 18$

$x^4 - 3x^2 - 18 = 0$

$y = x^2$ $y^2 - 3y - 18 = 0$

$(y-6)(y+3) = 0$

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

$x^2 = 6$

$x = \pm\sqrt{6}$

$x^2 = -3$

$x = \pm\sqrt{-3}$

$x = \pm i\sqrt{3}$

$\{\pm\sqrt{6}, \pm i\sqrt{3}\}$

9. Find all real solutions to the following equations.

$x^4 + x^2 - 12 = 0$

$y = x^2$ $y^2 + y - 12 = 0$

$(y+4)(y-3) = 0$

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

$x^2 + 4 = 0$ — no real solution

$x^2 - 3 = 0$

$x = \pm\sqrt{3}$

$\{\pm\sqrt{3}\}$

$4a - 5\sqrt{a} + 1 = 0$

$y = \sqrt{a}$ $4y^2 - 5y + 1 = 0$

$4y^2 - 4y - y + 1 = 0$

$4y(y-1) - 1(y-1) = 0$

$(4y-1)(y-1) = 0$

$(4\sqrt{a}-1)(\sqrt{a}-1) = 0$

$4\sqrt{a} = 1$

$\sqrt{a} = 1/4$

$a = 1/16$

$\sqrt{a} = 1$

$a = 1$

$\{\frac{1}{16}, 1\}$

10. Find two positive real numbers that differ by 1 and have a product of 1.

Let x = 1st number
$x+1$ = 2nd number } differ by 1.

$x(x+1) = 1$
$x^2 + x - 1 = 0$

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

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

x positive: $x = \frac{-1+\sqrt{5}}{2}$

$x+1 = \frac{-1+\sqrt{5}}{2} + \frac{2}{2}$

The numbers are $\frac{-1+\sqrt{5}}{2}$ and $\frac{1+\sqrt{5}}{2}$

11. Pat can mow her dad's lawn in 1 hour less than it takes her brother Doug. If they take 2 hours to mow it together, how long will it take Pat working alone? If your answer is irrational, leave it in radical form.

Let x = Pat's time
$x+1$ = Doug's time

Pat mows $\frac{1}{x}$ lawns/hr
$\frac{2}{x}$ lawns in 2 hours

Doug mows $\frac{1}{x+1}$ lawns/hr
$\frac{2}{x+1}$ lawns in 2 hours

$\left(\frac{2}{x} + \frac{2}{x+1}\right) = 1$ ← 2 hours to mow the lawn together

$x(x+1)$ $\cdot\, x(x+1)$

$2(x+1) + 2x = x(x+1)$
$4x + 2 = x^2 + x$
$x^2 - 3x - 2 = 0$

must be positive ↓

$x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2} = \frac{3 \pm \sqrt{17}}{2}$

Pat takes $\frac{3+\sqrt{17}}{2}$ hours