Math 172–Practice Assignment # 7 (NOT TO BE HANDED IN)

1. Solve $a^2 - 121 = 0$ by factoring.

$\{-11, 11\}$

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

$a-11=0 \quad a=11$

$a+11=0 \quad a=-11$

2. Solve $2x^2 = 3$ using the even-root property.

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

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

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

$x = \pm\frac{\sqrt{3}}{\sqrt{2}} \rightarrow x = \pm\frac{\sqrt{6}}{2}$

3. Solve $2x^2 - x = 6$ by completing the square.

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

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

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

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

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

$x - \frac{1}{4} = \pm\sqrt{\frac{49}{16}}$

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

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

$x = \frac{-6}{4}, \frac{8}{4}$

4. Solve $2x^2 + 3x - 1 = 0$ using the quadratic formula.

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

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

$x = \frac{-3 \pm \sqrt{9+8}}{4}$

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

5. For each equation below, find the value of the discriminant and state the number of real solutions to the equation. You do not need to solve the equations.

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

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

$= 1 - 96$

$= -95$

-95

zero

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

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

$= 1 - 1$

$= 0$

0

one

6. Consider $6x^2 - 7x - 4$. Find the discriminant and state whether the quadratic can be factored.

$b^2-4ac = (-7)^2-4(6)(-4)$

$= 49 + 96$

$= 145$ ← not a perfect square

145

NO

7. Find the complex solutions to $x^2+x+1=0$.

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

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

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

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

8. Find all solutions to $\frac{x^4}{3} = x^2+6$

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

Let $m=x^2$

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

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

$m^2-3m-18=0$

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

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

$x^2-6=0$ $\quad$ $x^2+3=0$

$x^2=6$ $\quad$ $x^2=-3$

$x=\pm\sqrt{6}$ $\quad$ $x=\pm\sqrt{-3}$

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

9. Find all real solutions to the following equations.

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

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

Let $m=x^2$

$m^2+m-12=0$

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

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

$x^2+4=0$ $\quad$ $x^2-3=0$

no real solution $\quad$ $x^2=3$

$x=\pm\sqrt{3}$

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

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

Let $m=\sqrt{a}$

$4m^2-5m+1=0$

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

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

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

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

$4\sqrt{a}-1=0$ $\quad$ $\sqrt{a}-1=0$

$4\sqrt{a}=1$ $\quad$ $\sqrt{a}=1$

$\sqrt{a}=\frac{1}{4}$ $\quad$ $a=1$

$a=\frac{1}{16}$

Check both solutions ✓✓

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

Let x = 1st #

$x-1$ = 2nd #

$x(x-1) = 1$

$x^2 - x = 1$

$x^2 - x - 1 = 0$

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

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

But the numbers must be positive.

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

The two 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 the lawn together, how long will it take Pat working alone? If your answer is irrational, leave it in radical form.

Let x = Pat's time (in hours)

$x+1$ = Doug's "

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

Doug " $\frac{1}{x+1}$ "

Together they mow $\frac{1}{2}$ lawn/hr

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

$2x(x+1)\left[\frac{1}{x} + \frac{1}{x+1} = \frac{1}{2}\right]$

$2(x+1) + 2x = x(x+1)$

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

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

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

$x = \frac{3 \pm \sqrt{17}}{2}$

But Pat's time must be positive.

So $x = \frac{3+\sqrt{17}}{2}$

Pat will take $\frac{3+\sqrt{17}}{2}$ hours on her own.