INTERMEDIATE ALGEBRA

GPS # 40 **8.4 THE QUADRATIC FORMULA** **NAME:** Kelly Fenton 20/20

Useful Guidelines:

The solutions of $ax^2+bx+c=0 (a \neq 0)$ are given by $x=\dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$. "Quadratic Formula"

If a, b, and c are integers, then the number and type of solutions can be predicted as follows:

* If the discriminant $b^2-4ac>0$, then we'll have two real solutions.
* If the discriminant $b^2-4ac=0$, then we'll have only one real solution.
* If the discriminant $b^2-4ac<0$, then we'll have two complex solutions.

1. Solve each equation using the quadratic formula and give the solution set.

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

$a=1 \quad b=-1 \quad c=-12$

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

$x=\dfrac{-(-1) \pm \sqrt{(-1)^2-4(1)(-12)}}{2(1)} = \dfrac{1 \pm \sqrt{1+48}}{2}$, $\dfrac{1 \pm \sqrt{149}}{2}$

$x=\dfrac{1}{2} \pm \dfrac{\sqrt{49}}{2} = \dfrac{1 \pm 7}{2} = \dfrac{1-7}{2}$ or $\dfrac{1+7}{2}$

$x=-3$ or 4 Sol. Set: $\{-3, 4\}$

b) $y^2-6y-8=0$

$a=1 \quad b=-6 \quad c=-8$

$y=\dfrac{-(-6) \pm \sqrt{(-6)^2-4(1)(-8)}}{2(1)}$ (36, +32, $-4(-8)$)

$y=\dfrac{6 \pm \sqrt{68}}{2} = \dfrac{6 \pm \sqrt{4} \cdot \sqrt{17}}{2}$

$y=\dfrac{6 \pm 2\sqrt{17}}{2} = 3 \pm \sqrt{17}$

Sol. Set $= \{3 \pm \sqrt{17}\}$

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

$i^2=-1$ (24, −9, 15)

$a=2 \quad b=-3 \quad c=3$

$x=\dfrac{-(-3) \pm \sqrt{(-3)^2-4(2)(3)}}{2(2)} = \dfrac{3 \pm \sqrt{-15}}{4}$ (9, $-8 \cdot 3$)

$x=\dfrac{3 \pm i\sqrt{15}}{4} = \dfrac{3}{4} \pm \dfrac{\sqrt{15}}{4} i$

real part, imag. part, imag. unit

Sol. Set: $\left\{\dfrac{3}{4} \pm \dfrac{\sqrt{15}}{4} i\right\}$

d) $4x^2-5x+2=0$

$a=4 \quad b=-5 \quad c=2$ (16, 2, 32)

$x=\dfrac{-(-5) \pm \sqrt{(-5)^2-4(4)(2)}}{2(4)}$ (25 − 32)

$x=\dfrac{5 \pm \sqrt{-7}}{8}$ $\quad x=\dfrac{5}{8} \pm \dfrac{\sqrt{7}}{8} i$

Sol. Set: $\left\{\dfrac{5}{8} \pm \dfrac{\sqrt{7}}{8} i\right\}$

2. Use the discriminant to predict whether the solutions to each equation are A. *one real solution*; B. *two real solutions*; C. *two complex solutions.*

a) $x^2+5x+4=0$

(15, 85, −16, 9)

$a=1 \quad b=5 \quad c=4$

$\sqrt{b^2-4ac}$

$=\sqrt{(5)^2-4(1)(4)}$

$=\sqrt{25-16} = \sqrt{9} = 9>0 =$ Two Real Solutions

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

$a=2 \quad b=-4 \quad c=2$

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

$=(16)-16$

$=0$ so $0=0$ one Real Solution $=A$

c) $5x^2-3x+7=0$

(20, 9, 140, −9, 131)

$a=5 \quad b=-3 \quad c=7$

$(-3)^2-4(5)(7)$

$(9)-140$

$=-131<0 =$ Two Complex Solutions $=C$

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

$a=1 \quad b=3 \quad c=-1$

$(3)^2-4(1)(-1)$

$9+4$

$=13>0$ Two Real Sol. $=B$