Notes: Solving Quadratic Equations by Factoring
"Riddle"
I am thinking of two numbers, $a$ and $b$.
The product of my numbers is zero.
What do you know about my numbers?

$$
\begin{aligned}
& \text { If } a \cdot b=0 \\
& \text { then } a=0 \text { or } b=0 \text { or both } \\
& \text { PROERTY of ZERO }
\end{aligned}
$$

Ex. 1

$$
\begin{gathered}
\text { a. } x \cdot(x-4)=0 \\
x=0 \quad x-4=0 \\
x=4
\end{gathered}
$$

$$
\{0,4\}
$$

Solution set
b.

$$
\begin{aligned}
& (x-4)(2 x+5)=0 \\
& x-4=0 \quad 2 x+5=0 \\
& x=4 \quad x=\frac{-5}{2}
\end{aligned}
$$

$$
\left\{-\frac{5}{2}, 4\right\}
$$

Ex. 2

$$
\begin{gathered}
\text { a. } m^{2}-10 m=0 \\
m(m-10)=0 \\
m=0 \quad m-10=0 \\
m=10 \\
\{0,10\}
\end{gathered}
$$

b. $9 x^{2}=49$

$$
\begin{gathered}
9 x^{2}-49=0 \\
(3 x+7)(3 x-7)=0 \\
3 x+7=0 \quad 3 x-7=0 \\
x=\frac{-7}{3} \quad x=\frac{7}{3} \\
\left\{ \pm \frac{7}{3}\right\}
\end{gathered}
$$

$$
\begin{array}{lc}
\text { c. } y^{2}+6 y=0 & \text { d. } 4 b^{2}-8 b-5=0 \\
y(y+6)=0 & (2 b-5)(2 b+1)=0 \\
y=0 \quad y=-6 & b=\frac{5}{2} \quad b=\frac{-1}{2} \\
\{-6,0\} & \left\{-\frac{1}{2}, \frac{5}{2}\right\}
\end{array}
$$

$$
\begin{array}{cl}
\text { e. } \begin{array}{cl}
x^{2}+2 x=63 & \text { f. }
\end{array} \begin{array}{cc}
x^{2}=7 r+4 \\
x^{2}+2 x-63=0 & 0=3 r^{2}+7 r+4 \\
(x+9)(x-7)=0 & (3 r+4)(r+1)=0 \\
x=-9 \quad x=7 & r=-\frac{4}{3} \quad r=-1 \\
\{-9,7\} & \left\{-\frac{4}{3},-1\right\}
\end{array} \$=\$ \text { } &
\end{array}
$$

$$
\begin{gathered}
(x-6)(x+2)=48 \\
x^{2}-4 x-12=48 \\
x^{2}-4 x-60=0 \\
(x-10)(x+6)=0 \\
x=10, x=-6 \\
\{-6,10\}
\end{gathered}
$$

Ex. 3 Find the zeros of the functions.
a. $f(x)=x^{2}-4 x-21$

Zeros:

$$
\begin{gathered}
x^{2}-4 x-21=0 \\
(x-7)(x+3)=0 \\
x=7 \quad x=-3
\end{gathered}
$$

b. $g(x)=9 x^{2}-4$
zeros:

$$
\begin{gathered}
9 x^{2}-4=0 \\
(3 x+2)(3 x-2)=0 \\
x=-\frac{2}{3} \quad x=\frac{2}{3}
\end{gathered}
$$

