1. (6 points) Solve the linear system

\[
\begin{align*}
    iz_1 - z_2 &= 1 + i \\
    3z_1 + 2iz_2 &= 1 - i
\end{align*}
\]

\[
\Rightarrow \begin{array}{c}
    R2 + 3iR1 \rightarrow R2 \\
    iR2 \rightarrow R2
\end{array}
\Rightarrow \begin{array}{c}
    iz_1 - z_2 = 1 + i \\
    -iz_2 = -2 + 2i
\end{array}
\]

\[
\Rightarrow \begin{array}{c}
    iR1 + R2 \rightarrow R1 \\
    -iR1 \rightarrow R1
\end{array}
\Rightarrow \begin{array}{c}
    z_1 = -1 + i \\
    z_2 = -2 - 2i
\end{array}
\]

2. (4 pts) Solve the quadratic equation

\[
z^2 - (2 + 2i)z - 2i = 0.
\]

**Quadratic formula:**

\[
z = \frac{(2 + 2i) \pm \sqrt{(2 + 2i)^2 + 8i}}{2} = \frac{(2 + 2i) \pm \sqrt{16i}}{2} = (1 + i) \pm 2\sqrt{i} = \ldots
\]
To find $\sqrt{i}$, you can use the method described in section 8.1 (pp. 370-371), or you can use polar coordinates. Specifically, since $Arg(i) = \pi/2$ and $|i| = 1$, it follows that $Arg(\sqrt{i}) = \pi/4$ and $|\sqrt{i}| = 1$, so

$$\sqrt{i} = \cos(\pi/4) + i \sin(\pi/4) = \frac{\sqrt{2}}{2} (1 + i).$$

Hence the two solutions of the quadratic equation are

$$z_1 = (1 + i) + \sqrt{2}(1 + i) = (1 + \sqrt{2}) + (1 + \sqrt{2})i$$

and

$$z_2 = (1 + i) - \sqrt{2}(1 + i) = (1 - \sqrt{2}) + (1 - \sqrt{2})i$$