(Q7)

(a)

$$
\begin{aligned}
(3+2i)z &= (2+i)(-2i) \\
(3+2i)z &= 2-4i \\
z &= (2-4i)\cdot\frac{3-2i}{3^2+2^2} = \frac{-(2+16i)}{13}
\end{aligned}
$$

(b)

$$
\begin{gathered}
z^6 = -125 \\
z^6 = 125e^{i(\pi+2k\pi)} \\
z = \sqrt[6]{125}e^{i\frac{\pi}{6}+\frac{2k\pi}{6}} \\
z = x+yi\ :\ x = \sqrt{5}\cos\left(\frac{\pi}{6}+\frac{2k\pi}{6}\right) \\
y = \sqrt{5}\sin\left(\frac{\pi}{6}+\frac{2k\pi}{6}\right) \\
\Downarrow \\
x = \sqrt{5}\cos(\frac{3\pi}{6}), \sqrt{5}\cos(\frac{5\pi}{6}), \ldots, \sqrt{5}\cos(\frac{13\pi}{6}) \\
= 0, \frac{\sqrt{15}}{2}, \frac{\sqrt{15}}{2}, 0, \frac{\sqrt{15}}{2}, \frac{\sqrt{15}}{2} \\
y = \sqrt{5}\sin(\frac{3\pi}{6}), \sqrt{5}\sin(\frac{5\pi}{6}), \ldots, \sqrt{5}\sin(\frac{13\pi}{6}) \\
y = \sqrt{5}, \pm\frac{\sqrt{5}}{2}, -\sqrt{5}, \mp\frac{\sqrt{5}}{2} \\
\Downarrow \\
z = \pm\sqrt{5}i, \frac{\sqrt{15}}{2} \pm \frac{\sqrt{5}}{2}
\end{gathered}
$$

(c)

$$
\begin{gathered}
e^z = 1-\sqrt{3}i \\
e^x e^i y = \sqrt{1+3}e^{i\frac{\pi}{3}} = 2e^{i\frac{\pi}{3}} \\
\therefore e^x = 2 \implies x = \ln 2, y = -\frac{\pi}{3} \\
\therefore z = \ln 2 - \frac{\pi}{3}i
\end{gathered}
$$