1.a) $z = 1+i$

$z^2 = 2i$

$z^3 = -2+2i$

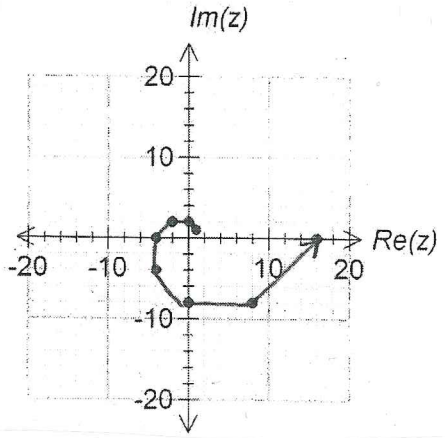
$z^4 = -4$

$z^5 = -4-4i$

$z^6 = -8i$

$z^7 = 8-8i$

$z^8 = 16.$



Spirals Out.

1b i) $z = 0.5-0.5i$

$z^2 = -0.5i$

$z^3 = -0.25-0.25i$

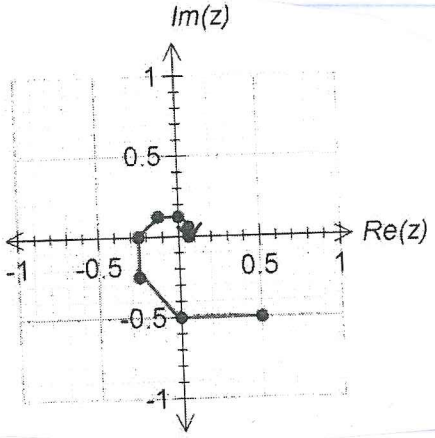
$z^4 = -0.25$

$z^5 = -0.125+0.125i$

$z^6 = 0.125i$

$z^7 = 0.0625+0.0625i$

$z^8 = 0.0625$



Spirals in

bii) $z = \frac{\sqrt{3}}{2} + \frac{1}{2}i$

$z^2 = \frac{1}{2} + \frac{\sqrt{3}}{2}i$

$z^3 = i$

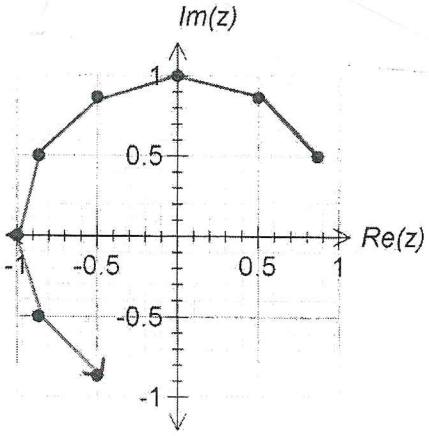
$z^4 = -\frac{1}{2} + \frac{\sqrt{3}}{2}i$

$z^5 = -\frac{\sqrt{3}}{2} + \frac{1}{2}i$

$z^6 = -1$

$z^7 = -\frac{\sqrt{3}}{2} - \frac{1}{2}i$

$z^8 = -\frac{1}{2} - \frac{\sqrt{3}}{2}i$



Doesn't spiral in or out.

biii $z = \sqrt{3}\,\mathrm{cis}\left(-\frac{\pi}{6}\right)$

$z = \frac{3}{2} - \frac{\sqrt{3}}{2}i$

$z^2 = \frac{3}{2} - \frac{3\sqrt{3}}{2}i$

$z^3 = -3\sqrt{3}i$

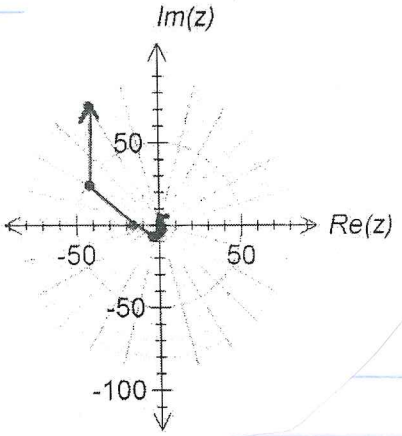
$z^4 = -\frac{9}{2} - \frac{9\sqrt{3}}{2}i$

$z^5 = -\frac{27}{2} - \frac{9\sqrt{3}}{2}i$

$z^6 = -27$

$z^7 = -\frac{81}{2} + \frac{27\sqrt{3}}{2}i$

$z^8 = -\frac{81}{2} + \frac{81\sqrt{3}}{2}i$



Spirals Out.

biv) $z = \frac{1}{\sqrt{2}}\,\mathrm{cis}\left(\frac{2\pi}{3}\right)$

$z = -\frac{\sqrt{2}}{4} + \frac{\sqrt{6}}{4}i$

$z^2 = -\frac{1}{4} - \frac{\sqrt{3}}{4}i$

$z^3 = \frac{\sqrt{2}}{4}$

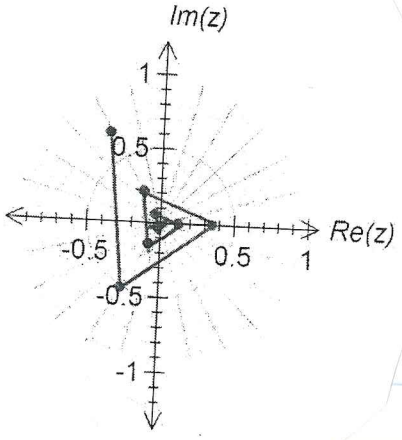
$z^4 = -\frac{1}{8} + \frac{\sqrt{3}}{8}i$

$z^5 = -\frac{\sqrt{2}}{16} - \frac{\sqrt{6}}{16}i$

$z^6 = \frac{1}{8}$

$z^7 = -\frac{\sqrt{2}}{32} + \frac{\sqrt{6}}{32}i$

$z^8 = -\frac{1}{32} - \frac{\sqrt{3}}{32}i$



Spirals in

2. The questions that spiraled out were

1a) $z = 1 + i$ $\quad |z| = \sqrt{2} > 1$

and

1biii) $z = \frac{3}{2} - \frac{\sqrt{3}}{2}i$ $\quad |z| = 3 > 1$

The question that didn't spiral out or in was

1bii) $z = \frac{\sqrt{3}}{2} + \frac{1}{2}i$ $\quad |z| = 1$

The questions that spiraled in were

1bii) $z = 0.5 - 0.5i$ $\quad |z| = \sqrt{0.5} < 1$

and

1biv) $z = \frac{-\sqrt{2}}{4} + \frac{\sqrt{6}}{4}i$ $\quad |z| = \sqrt{0.5} < 1$

∴ If the magnitude of z is greater than 1 it spirals out, equal to 1 it does neither, less than 1 it spirals in.