(1) Modulus & amplitude of each of the complex numbers.

(i) $z = 1 + \cos\theta + i\sin\theta$.

$= 2\cos^2\left[\frac{\theta}{2}\right] + i\,2\sin\left[\frac{\theta}{2}\right]\cdot\cos\left[\frac{\theta}{2}\right]$

$z = 2\cos\left[\frac{\theta}{2}\right]\left[\cos\left[\frac{\theta}{2}\right] + i\sin\left[\frac{\theta}{2}\right]\right]$

therefore $|z| = 2\cos\left[\frac{\theta}{2}\right]$ and $\arg z = \left[\frac{\theta}{2}\right]$

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(5) Evaluate $\int_0^{2a}\int_0^{\sqrt{2ax-x^2}} xy\,dy\,dx$.

Let $I = \int_0^{2a}\int_0^{\sqrt{2ax-x^2}} xy\,dy\,dx$

$= \int_0^{2a} x\left[\frac{y^2}{2}\right]_0^{\sqrt{2ax-x^2}} dx = \frac{1}{2}\int_0^{2a} x\left[(2ax-x^2) - 0\right]dx$

$= \frac{1}{2}\int_0^{2a}(2ax^2 - x^3)\,dx = \frac{1}{2}\left[2a\frac{x^3}{3} - \frac{x^4}{4}\right]_0^{2a}$

$= \frac{1}{2}\left[\frac{2a}{3}\left[(2a)^3 - 0\right] - \frac{1}{4}\left((2a)^4 - 0\right)\right]$

$= \frac{1}{2}\left[\frac{16a^4}{3} - \frac{16a^4}{4}\right] = \frac{16a^4}{2}\left[\frac{1}{3} - \frac{1}{4}\right]$

$= 8a^4\left[\frac{4-3}{12}\right] = \frac{2a^4}{3}$ //.