[1] (a) $Z = \frac{X-\mu}{\sigma}$, $f_Z(x) = e^{-\frac{1}{2}x^2} \cdot \frac{1}{\sqrt{2\pi}}$

$E(Z) = 0$, $E(Z-\mu)^2 = 1$

$E(Z_0 + Z_1) = 0$; $E(Z_0 + Z_1 - \mu)^2 = 1+1 = 2$

(b) $Q_1 = Z^2$: $\chi^2 (df = 1)$

(c) $Q_2 = Z_1^2 + Z_2^2$: $\chi^2 (df = 2)$

[2] (a) $P(Z_0 + Z_1 \le 1) = 0.6914$, (1-St. norm.sf (1, 0, 2))

(b) $P(Z_0^2 \le 1) = 0.8413$, (1-St. norm.sf (1, 0, 1))

(c) $P(Z_1^2 + Z_2^2 \le 1) = 0.6914$, (1-St. norm.sf (1, 0, 2))

(d) $P\left(\frac{Z_0}{Z_1} \le 1\right)$

[3] (a) $\mu_A = 65$, $\frac{\sigma_A^2}{n} = \frac{3^2}{25} = \frac{9}{25}$

$Z = \frac{\bar{X}_A - 65}{\frac{3}{5}}$

$P(\bar{X}_A \le 64) = P\left(\frac{\bar{X}_A - 65}{\frac{3}{5}} \le \frac{64-65}{\frac{3}{5}}\right) = P(Z \le -1.67) \doteq 0.04746 = 4.7\%$

(b)