1a) $P(X < 409) = 0.0388$ (3sf)

b) $H_0 : \mu = 415$

$H_1 : \mu < 415$

c) $N\left(\mu, \frac{\sigma^2}{n}\right)$

$N\left(415, \frac{3.4^2}{20}\right)$

$P(X < 413) = 0.00426$ (3sf)

$0.00426 < 0.01$ $\therefore$ we reject H_0 and accept H_1.

There is evidence to suggest the machine is producing tins with a mean of less than 415g.

2a) $P(X > 235) = 0.0304$ (3sf)

b) $H_0 : \mu = 220$
$H_1 : \mu \neq 220$

c) $N\left(\mu, \frac{\sigma^2}{n}\right)$

$N\left(220, \frac{8^2}{10}\right)$

$P(X > 230) = 0.0000386$

$0.0000386 < 0.005$ $\therefore$ we reject H_0 and accept H_1.
There is evidence to suggest the mean time has changed.

3a/ $\text{mean} = \frac{46313}{200} = 231.565$

$$\sigma = \sqrt{\frac{10861255}{200} - (231.565)^2}$$

$$= 26.2 \quad (3sf)$$

b/ $H_0 : \mu = 235$

$H_1 : \mu < 235$

$N\left(\mu, \frac{\sigma^2}{n}\right)$ [approximate σ as 26.2]

$N\left(235, \frac{"26.2"^2}{200}\right)$

$P(X < 231.565) = 0.0319 \quad (3sf)$

$0.0319 > 0.01$ $\therefore$ we accept H_0.
There is not enough evidence to suggest the manager's claim is correct.

Assuming the standby times are normally distributed.