Question 1

a)
$$H_0: \quad \mu_1 - \mu_2 = 0$$
$$H_a: \quad \mu_1 - \mu_2 \neq 0$$

b)
$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_{01} - \mu_{02})}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$
$$= \frac{(20.5 - 19.3) - (0)}{\sqrt{\frac{12.1}{41} + \frac{14.3}{33}}}$$
$$= \frac{1.2}{0.8534} = 1.41.$$

Two-tailed test:

$$\begin{aligned} \Rightarrow \text{p-value} &= 2 \times \Pr(Z > |z|) \\ &= 2 \times \Pr(Z > |1.41|) \\ &= 2 \times \Pr(Z > 1.41) \\ &= 2(0.0793) = 0.1586. \end{aligned}$$

c) The p-value tells us that there is a 15.86% chance of obtaining results such as those observed assuming H_0 is true.

Therefore, the results are not unusual; we cannot reject H_0 (since the p-value is greater than the standard α levels, 0.05 and 0.01)

Conclusion: there is no difference between the true means.