Durham University
MATH1541 Statistics
Exercise Sheet 12

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1 Q1

1.1 a)

$c = 2.120$
Under $\sim N$, $c = 1.960$

1.2 b)

$c = 1.895$
Under $\sim N$, $c = 1.645$

1.3 c)

t_{30}, $c = 2.042$
t_{40}, $c = 2.021$
t_{35}, $c \approx \frac{2.042+2.021}{2} = 2.0315$ (Calculator gives 2.0301)
Under $\sim N$, $c = 1.960$

1.4 d)

$\mathrm{P}(T > 1.5) \approx 0.080$
Under $\sim N$, $\mathrm{P}(T > 1.5) \approx 0.067$

1.5 e)

$\mathrm{P}(T > 1.5 \cap T < -1.5) \approx 0.16$
Under $\sim N$, $\mathrm{P}(T > 1.5) \approx 0.134$

2 Q3

2.1 a)

$\bar{X}$ will have an approximately Normal distribution - that is to say, $\bar{X} \sim N(\mu, \frac{\sigma^2}{n})$. Because X has a distribution with mean μ and variance σ^2, and $n \geq 10$, we can use the Central Limit Theorem to assume $\bar{X}$'s distribution.

2.2 b)

When $n = \infty$

2.3 c)

Assuming $\sim N(0, 1)$, since σ is known, $c = 1.960$

2.4 d)

2.4.1 i)

Plot attached.
The normal quantile plot is not very linear - an incredibly "fat pen" would be necessary to encapsulate the data. The use of a t-distribution would probably not be fully appropriate in this scenario.

2.4.2 ii)

t_{12}, $c = 2.179$

2.4.3 iii)

t_{12}, $c = 0.695$