1.

(i)

We use the F-test to test whether the variance are equal.

$H_0: \sigma_1^2 = \sigma_2^2 \quad H_1 \; \sigma_1^2 \neq \sigma_2^2$

$$F = \frac{S_1^2}{S_2^2} = \frac{9.1^2}{16.1^2} = 0.3195.$$

Under H_0, $F \sim F(n_1-1, n_2-1)$

$= F(59, 69)$

So the rejection region is

$F > F_{1-\alpha/2}(59, 69)$ or $F < F_{\alpha/2}(59, 69)$

$F > 1.6341$ or $F < 0.6060.$

Since $F = 0.3195$, we reject H_0.

The two variance are not equal.

(ii)

For the test of mean differences

we need to use t-test.

The F-test in (i) will determine

whether the ~~t-test~~ t-test with equal variance

or the t-test with unequal variance

should be used.

2.

The total Revenue is

$$R = \int_0^Q (100 - 4s - s^2)\, ds$$

$$= 100Q - 2Q^2 - \frac{1}{3}Q^3$$

The total cost is

$$C = 80 + \int_0^Q 7.5 e^{0.15s}\, ds$$

$$= 80 + 7.5 \left. \frac{e^{0.15s}}{0.15} \right|_0^Q$$

$$= 80 + 50 e^{0.15Q}$$

So the profit is

$$\text{profit} = R - C$$

$$= 100Q - 2Q^2 - \frac{1}{3}Q^3 - 80 - 50e^{0.15Q}$$

3.

$$MPC = 0.5 + \frac{0.2}{Y^{\frac{1}{2}}}$$

Note that

$$\int_0^Y 0.5 + \frac{0.2}{s^{\frac{1}{2}}} \, ds$$

$$= 0.5Y + 0.2 \cdot (2s^{\frac{1}{2}} |_0^Y)$$

$$= 0.5Y + 0.4Y^{\frac{1}{2}}$$

So the aggregated consumption function is

$$C_0 + 0.5Y + 0.4Y^{\frac{1}{2}}.$$

when Income $= 100$ $C = 60$.

we have

$$C_0 + 0.5 \times 100 + 0.4 \times 10 = 60$$

$$C_0 = 6.$$

So the aggregated consumption function is

$$6 + 0.5Y + 0.4Y^{\frac{1}{2}}.$$