1. Complete the ANOVA table using the given results. Show all your work below the table.

Source of variation	Sum of squares	Degrees of freedom	Mean squares
Regression	29.23	1	29.23
Residual	3.5	2	1.75
Total	32.73	3	——

$n=4$

$df\,Reg = 1 \quad df\,Res = n-2 = 2 \quad def\,Tot = df\,Reg + df\,Res = 2+1 = 3$

$\hat{\beta}_0 = 11.5, \ \hat{\beta}_1 = -1.5$

Since $MSRes = \frac{SSRes}{n-2} = \frac{SSRes}{2} = 1.75$,

then $SSRes = 1.75 \times 2 = 3.5$

$$t = \frac{\hat{\beta}_1 - \beta_1^\circ}{S(\hat{\beta}_1)} = \frac{\hat{\beta}_1}{S(\hat{\beta}_1)} = -4.087$$

$$S(\hat{\beta}_1) = \frac{\hat{\beta}_1}{-4.087} = \frac{-1.5}{-4.087} = \frac{1500}{4087}$$

$$S^2(\hat{\beta}_1) = \left(\frac{1500}{4087}\right)^2 \approx 0.1347$$

Since $S^2(\hat{\beta}_1) = \frac{S^2}{\sum_{j=1}^{4}(x_j-\bar{x})^2} = \frac{MSRes}{\sum_{j=1}^{4}(x_j-\bar{x})^2} = \frac{1.75}{\sum_{j=1}^{4}(x_j-\bar{x})^2} = 0.1347$

then $\sum_{j=1}^{4}(x_j-\bar{x})^2 \approx 12.99166$

So, $SSReg = \hat{\beta}_1^2 \sum_{i=1}^{4}(x_i-\bar{x})^2 = (-1.5)^2 \cdot 12.99166 \approx 29.23$

So, $SSTot = SSReg + SSRes$

$= 29.23 + 3.5$

$= 32.73$

2. Compute the F statistic using the ANOVA table. Is there something special about this statistic?

$$F^* = \frac{MS\,Reg}{MS\,Res} = \frac{29.23}{1.75} = 16.70$$

$$t^2 = 4.087^2 \approx 16.70$$

Thus, we can see that $F^* = t^2$ and it only holds for simple linear regression.