1. Let $F$ be a monic polynomial over an integral domain $A$. Recall the definition of the resultant from Problem Set # 5. Show that
$$\Delta(F)A = \text{Res}(F, F')A.$$ 

2. p.42, Ex. 4.

3. p. 51, Ex. 2.

4. Let $A$ be a Dedekind domain with field of fractions $K$. Let $L$ and $L'$ be finite separable extensions of $K$ and suppose that there exist $\alpha \in L$ and $\alpha' \in L'$ such that the integral closure of $A$ in $L$ is $A[\alpha]$ and the integral closure of $A$ in $L'$ is $A[\alpha']$. Suppose furthermore that $\Delta(A[\alpha]/A) + \Delta(A[\alpha']/A) = A$. Let $M$ be the compositum $LL'$ over $K$. Is the integral closure of $A$ in $M$ necessarily equal to $A[\alpha, \alpha']$? Give a proof or a counterexample.

5. Let $p$ and $q$ be primes in $\mathbb{Z}$ with $p \neq q$. Find the integral closure of $\mathbb{Z}$ in $\mathbb{Q}(\xi_{pq})$ where $\xi_{pq}$ a primitive $pq$-th root of unity. Justify your answer.

6. Let $\xi_{p^2}$ be a $p^2$-th root of unity. Calculate $N_{\mathbb{Q}(\xi_{p^2})/\mathbb{Q}}(1 - \xi_{p^2})$. 
