10. Show that the equation $x^7 + 3x^5 - 3x^2 - 4 = 0$ has 6 complex roots. Is the 7th root positive or negative? [12½]

11. Coffee is bought at 36 cents a pound and chicory at 9 cents a pound; in what proportion must they be mixed so that 10% may be gained by selling the mixture at 33 cents a pound? [8, 4½]

12. A train $A$ starts to go from $P$ to $Q$, two stations 240 miles apart, and travels at a uniform rate. An hour later another train $B$ starts from $P$ and, after traveling for 2 hours, comes to the point that $A$ has passed 45 minutes previously. The rate of $B$ is now increased by 5 miles an hour and it overtakes $A$ on entering $Q$. Find the rates at which the trains started. [9, 3½]