

All curves are positively oriented unless otherwise noted.

1. Complete the proof of Rouché's theorem solving problem 10, §63, of your book.
2. Find the number of roots of the following polynomials in the region $|z| < 1$.
(a) $z^6 - 5z^4 + z^3 - 2z$, (b) $2z^4 - 2z^3 + 2z^2 - 2z + 9$.
3. Find the number of roots of the function $2z^5 - 6z^2 + z + 1$ in the region $1 \leq |z| < 2$.
4. If $c \in \mathbb{C}$, $|c| > e$, show that the equation $cz^n = e^z$ has n roots in the region $|z| < 1$.