

MAT505 - Extra problem set 2

1. For what values of a is there a boundary layer at $x = 0$ for the problem $\epsilon y'' + x^{a-1}y' + y = 0$ with $y(0) = y(1) = 1$ and $\epsilon \ll 1$. If there is a boundary layer, find its thickness as well as the leading order matched asymptotic expansion.

2. Find the leading order matched asymptotic expansion for the solution of

$$\epsilon y'' + yy' - y = 0, \text{ with } y(0) = -1, \quad y(1) = 0,$$

as $\epsilon \rightarrow 0+$.