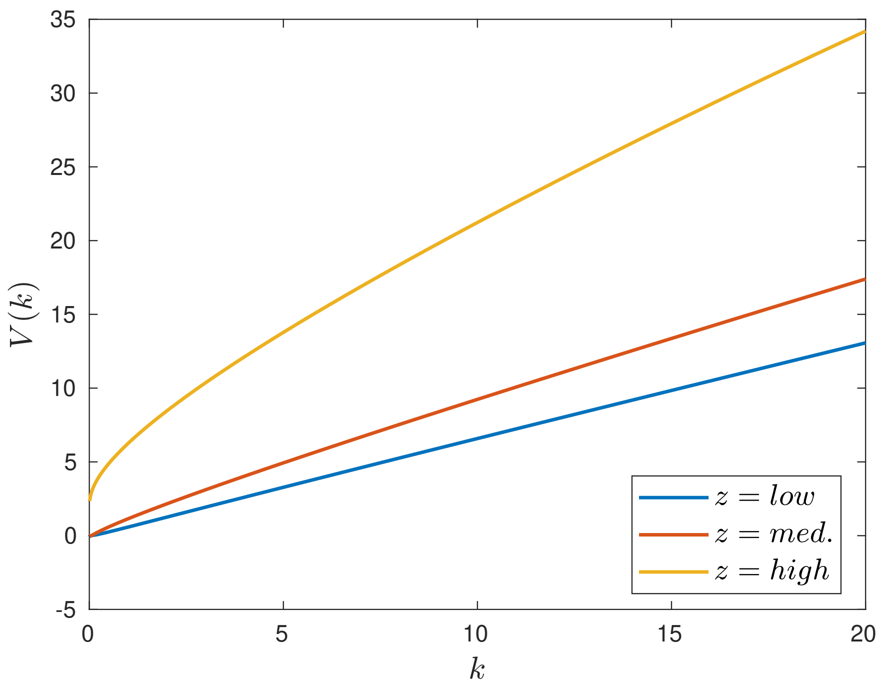
# Problem 1

- Note: there are two codes offered for this problem. The Matlab code is quite intuitive and understandable, but it is not computationally efficient. The Julia code is rather quite fast and computationally efficient.

Here is the results by Matlab code:

I choose $\bar{z}$ to set "steady state" capital $k$ to 1. At this level of capital, marginal return to capital is equal to depreciation plus discount rate, given average $z$. I use a grid of 501 size for capital and 21 for productivity. I then set $k_{min} = 0.01$ and $k_{max} = 25$. Note that $k_{min} = 0$ is not appropriate, since for new entrants the cost of investment would be infinity ($\phi$ is not well-defined).

Here is the value and policy functions for three values of minimum, median and maximum productivity, $z$:

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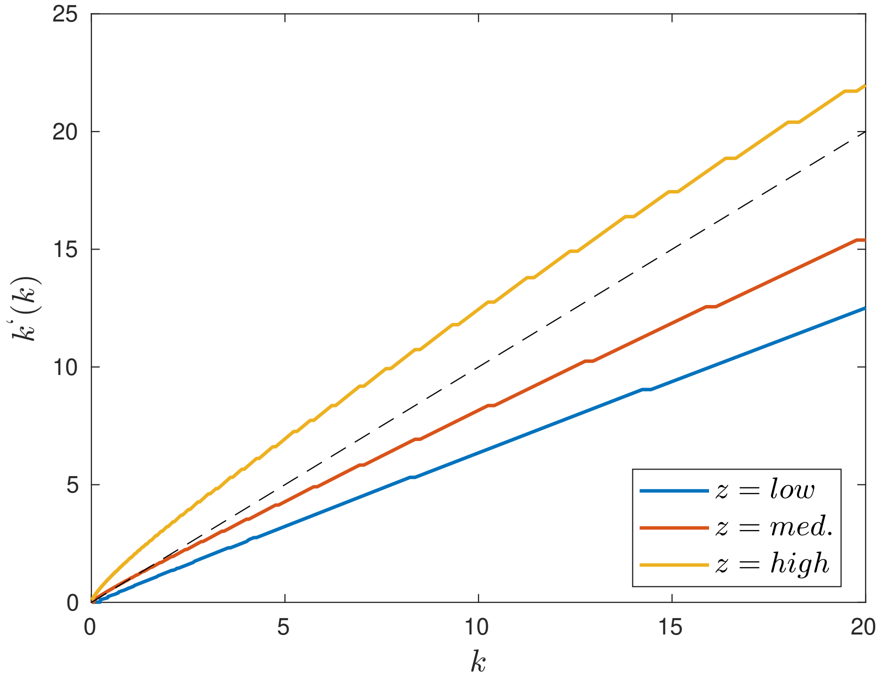
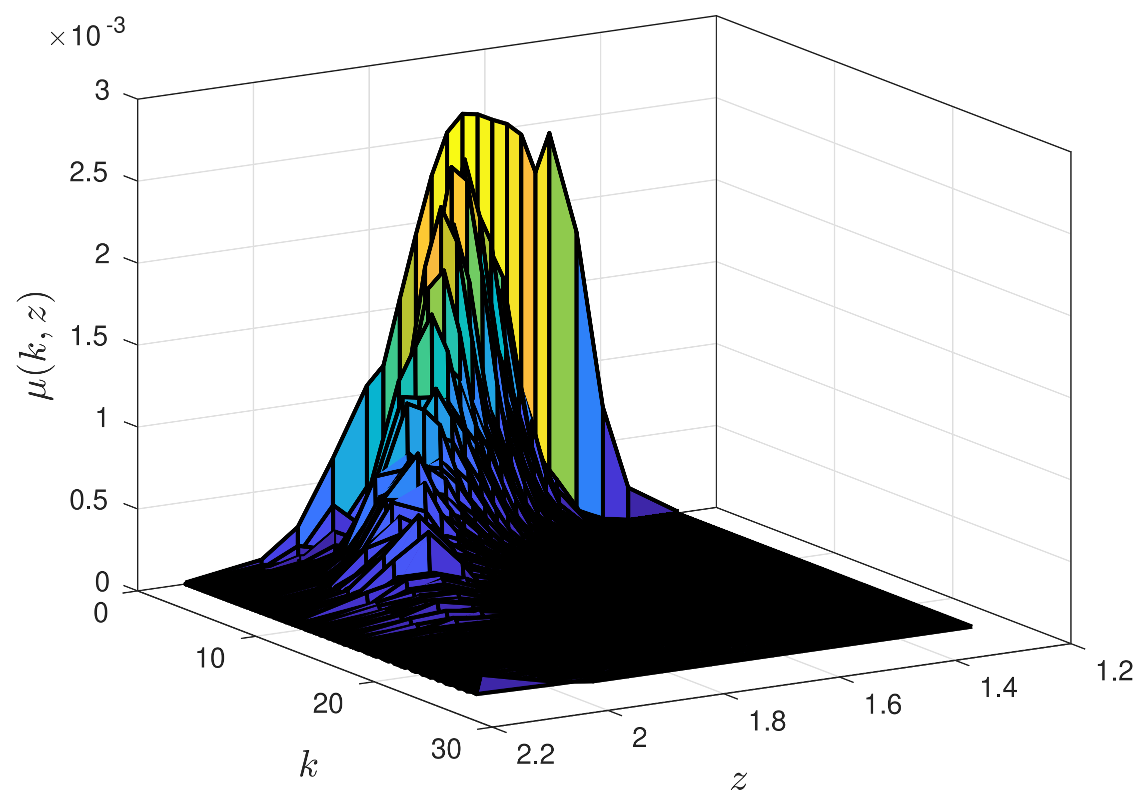



Using this policy function and value function I solved for *exit* strategy, i.e. the states in which expected value is negative. I then solved for a value of fixed cost $f$, so that given an entry *flow* 2.5%, the long-run exit *rate* almost converges to 2.5%. By this algorithm, the total mass of firms in long-run should converge to one.
The stationary distribution is plotted here:



In order to calibrate the exit rate, a value $f = 0.0289$ for the fixed cost is calibrated. The exit rate solved from steady state distribution and exit policy is about 2.45%. The required entry cost to calibrate the total measure of firms is positive: $e = E_z[V(z, 0)] = 0.0180$.
Finally, using the stationary distribution we can calculate the total demand for labor from firms and using market clearing for labor market and $W = 2$ we find $B = 0.2177$. If we rather set $B = 1$, the mass of firms would be 4.6.