1 Questions, etc

- V2 Gaussian
- Exponential Accuracy
- FEM and FDM
- Modelling particle of differnt sizes/ anisotrophic/...

- weird thing in save2png
- error when trying save2pdf

2 Comparing the fixed point algorithm with `fsolve`

In order to compute the computational time taken of the fixed point algorithm and the inbuilt Matlab function `fsolve`, Example 1 in Section ++ is considered. Note that the comparison is slightly impacted by the fact that convergence is measured differently in these two numerical methods. However, a general comparison can be made on the efficiency of the two approaches. We choose $n = 20$, $N = 30$, the ODE solver tolerance is set to be 10^{-8} and the optimality tolerance is 10^{-4} and $\beta = 10^{-3}$. As can be seen in Table 1, the running time of the fixed point algorithm is considerably faster than for `fsolve`, while the resulting cost functionals remain the same. This can be confirmed by comparing the number of function evaluations computed with each method. The differences in ρ and q are broadly in line with the optimality tolerance set, however the control differs more (why?). (+ Note: fsolve says:'Equations solved, inaccuracies possible' - it never actually reached the optimality tolerance ++)

	γ	Time taken (s)	F.Evals	J_{FW}	J_{Opt}	ρ_{Diff}	q_{Diff}	$\vec{w}_{Diff}$
Fixed Point		106.4930	667	0.0438	0.0011			
`fsolve`	-1	6.3670×10^4	35384	0.0438	0.0011			
Difference		fix				3.3515×10^{-4}	1.0922×10^{-5}	0.0076
Fixed Point		101.4840	656	0.0434	0.0020			
`fsolve`	1	3.3481×10^4	31957	0.0434	0.0020			
Difference						6.7721×10^{-4}	3.8226×10^{-5}	0.0204

Table 1: Update this table eventually.

gamma	beta	Iters	JFW	JOpt
0	1×10^{-3}	671	4.1667×10^{-2}	1.4467×10^{-3}
0	1×10^{-1}	656	4.1667×10^{-2}	2.8272×10^{-2}
-1	1×10^{-3}	667	4.3751×10^{-2}	1.0897×10^{-3}
-1	1×10^{-1}	649	4.3751×10^{-2}	2.7033×10^{-2}
0	1×10^{-3}	726	6.6902×10^{-2}	1.0919×10^{-2}
0	1×10^{-1}	770	6.6902×10^{-2}	6.0339×10^{-2}
-1	1×10^{-3}	724	5.3559×10^{-2}	9.6531×10^{-3}
-1	1×10^{-1}	769	5.3559×10^{-2}	4.9268×10^{-2}

Table 2: Test for print to matlab - ignore.