ABE 457
Spring 2018
Homework #1

Due: 1/15/18

1. Shear rate vs shear stress data for tomato ketchup is given below.

$\dot{\gamma}\left(s^{-1}\right)$	$\tau\,(Pa)$
0.01	2.8
0.02	3.3
0.05	4.46
0.1	6.0
0.2	8.48
0.5	14.3
1.0	22.0

   Estimate the rheological parameters for tomato ketchup.

2. Rheological data (shear rate versus shear stress) for milk chocolate at 40 C are given in the table below. Determine the rheological parameters for chocolate using an casson body appropriate model.

$\dot{\gamma}\left(s^{-1}\right)$	$\tau\,(Pa)$
0.1	14.97
0.2	17.33
0.5	22.5
1.0	29.14
2.0	40.0
5.0	66.62
10.0	104.72

3. Rheological data for concentrated orange juice at four different temperatures, are given in the table below. Describe the data using the rheological model expressed by:

$$\tau = K_0 \exp(\frac{E}{RT})(\dot{\gamma})^n$$

-18.8 C		-5.4 C		9.5 C		29.2 C	
$\tau\,(Pa)$	$\dot{\gamma}\left(s^{-1}\right)$	$\tau\,(Pa)$	$\dot{\gamma}\left(s^{-1}\right)$	$\tau\,(Pa)$	$\dot{\gamma}\left(s^{-1}\right)$	$\tau\,(Pa)$	$\dot{\gamma}\left(s^{-1}\right)$
14.4	0.5	4.3	0.6	2.6	1.1	3.6	8
24.3	1	6.5	1	10.3	8	7.6	20
141.9	10	38.4	10	17.1	15	13.1	40
240.4	20	65.4	20	29.5	30	17.5	60
327.2	30	88.7	30	50.3	60	31.2	120
408.0	40	111.1	40	69.4	90	54.5	240

483.9	50	131.9	50	103.3	150	94.4	480
555.9	60	151.7	60	153.8	250	141.7	800
635.2	70	171.3	70	200	350	170	1000
692	80	189	80	243	450	183	1100