

Hwmk 12

Math 528 Summer Session 1

Due 6/10 (Thursday at 11:59 pm)

1 Textbook... I'm Shook

Do the following problems in your book:

- (a) 2 points pg 237 problem 6 and 20
- (b) 2 points pg 241 problems 4 and 6

2 Lemonade Mixer 3.0

Time for the final version of your industrial lemonade mixer the 3.0 (guess we ran out of R and D funds...)! Like before, it has two 5 gallon tanks completely filled with lemon juice. Both tank 1 and tank 2 initially contain no sugar. From a connecting pipe, lemon juice leaves tank 1 into tank 2 at the rate of 2 gals/min. From a separate connecting pipe, lemon juice leaves tank 2 into tank 1 at the rate of 2 gals/min. Lastly, you are adding sugar via a sugar hopper into tank 1 at 4 oz/min.

- (a) 1 point Set up the system of differential equations that will give the amount of sugar in tank 1, $S_1(t)$, and tank 2, $S_2(t)$, at any given time.
- (b) 2 points Transform this system using the Laplace transform
- (c) 2 points Solve for $S_1(t)$ and $S_2(t)$ by inverting the transform.
- (d) 1 point You have your tap handle on tank 2. How many minutes will it take for the concentration of tank 2 be at the perfect level of 14 oz of sugar per gallon (this will be when you need to turn off the hopper). If you can't solve this by hand, try an online calculator.