

This is the take home portion of the test. You will be given the same questions in class to justify with a written statement. These questions are very involved and you should spend a significant amount of time justifying your results.

Directions:

- For each of the following problems solve completely and show all of your work (Please attach any additional work to this sheet to turn in).
 - Provide a written justification in the space provided using complete sentences.
- 1.) Spirit airlines offers a new way people can travel for cheap. Profit is very thin for tickets sold but they make much more profit by adding on additional charges for each person that flies. Unlike other airlines they charge you for EVERYTHING! Based upon this assessment a travel company has hired you to design a function (to be used on their website) to accurately calculate the total charges for a ticket on spirit airlines.

<p>Inputs: T = Number of tickets sold S = amount spent on snacks and drinks C = Number of carry on bags H = number of checked bags L = additional legroom</p>	<p>Pricing Information to be included A ticket has a base price of 87\$ Each carryon is 25\$ Each checked bag is 35\$ You can get additional legroom for \$40 Promotion: Taxes and fees on the ticket and bags are 15.5% Taxes and fees on the snacks are 8.5%</p>
---	--

- a.) Design your function and label any pieces you find to be important.
- b.) Suppose that instead of a fixed price per ticket the cost is a function of the number of days prior to your trip expressed by the function $f(n) = (-.04n + 2)^8 + 50$. Explore this function using a graphing utility and describe when the best time to book a ticket might be and why.
- c.) Using this new information, design a new total cost function that includes $f(n)$ to describe the fluctuating price of a ticket.

BONUS: Actually design a short program that will do this calculation automatically. You can use excel, desmos, or any other platform of your choosing to accomplish this but a user should be able to input information and a grand total should be created. The program must be completed and sent to Mr. Allen.

- 2.) The concentration (in milligrams per liter) of a medication in a patient's blood as time passes is given by the data in the following table.

Hours	mg/L
0	0
.5	78.1
1	99.8
1.5	84.4
2	50.1
2.5	15.6

- a. Find the linear, quadratic and cubic regression equations and correlation coefficients.
- b. State which model, best fits the data and explain why.
- c. If doctors want to be sure that the concentration doesn't go below 5.5mg/L approximately how often will the medicine need to be given?
- d. This model works best for a person with a weight of 70Kg and the concentration is proportional to a person's weight such that the function adjusted for weight will be modeled by:
- $$W(t) = \frac{70}{w} f(t)$$
- Where $W(t)$ is the function adjusted for weight
 $f(t)$ is the original function derived from above
 w is a person's weight in Kg

Find the adjusted function and maximum concentration in a person who is 90Kg.