

LAB
Exponential Functions

1. Discuss the nature of an exponential function $f(t) = 2 \cdot b^t$ where $b > 1$.

In your discussion, include the following:

- a) The domain
- b) The range
- c) The asymptote(s)
- d) The concavity
- e) The nature of the function as to its increasing and/or decreasing
- f) The nature of the rates-of-change of the function as to their increasing and/or decreasing
- g) The changes in the graphs of the function as b increases
- h) Graphs to illustrate your discussion.

2. Discuss the nature of an exponential function $f(t) = 2 \cdot b^t$ where $0 < b < 1$.

In your discussion, include **all** of the points of #1 above with this change in **g**:

- g) The changes in the graphs of the function as b decreases from 1 to 0.

3. A patient has an intravenous-drip being administered that continuously admits a certain drug to the patient. The quantity, Q , in milliliters of the drug in the patient's body at time, t , in hours is represented by the table below.

Time t (hours)	0	4	8	12	16	20	24	28
Quantity Q (ml)	0	2.841	4.068	4.598	4.826	4.925	4.968	4.986

- a) Graph this data.
 - b) Analyze the graph with respect to the following:
 - 1) The domain
 - 2) The range
 - 3) The asymptote(s), if any
 - 4) The concavity
 - 5) The nature of the function as to its increasing and/or decreasing
 - 6) The nature of the rates-of-change of the function as to their increasing and/or decreasing
4. The table below shows the population of Ireland at various times between 1780 and 1910 where 0 corresponds to 1780.

Years since 1780	0	20	40	60	70	90	110	130
Population (millions)	4.0	5.2	6.7	8.3	6.9	5.4	4.7	4.4

- a) When was the population increasing? Decreasing?
- b) For each successive time interval, construct a table showing the average rate of change of the population.
- c) From the table you constructed in part (b), when is the graph of the population concave up? Concave down?
- d) When was the average rate of change of the population the greatest? The least? How is this related to part (c)? What does this mean in human terms?
- e) Graph the data in the table and join the points by a curve to show the trend in the data. From this graph identify where the curve is increasing, decreasing, concave up and concave down. Compare your answers to those you got in part (a) and (c). Identify the region you found in part (d).
- f) Something catastrophic happened in Ireland between 1780 and 1910. When? What happened in Ireland at that time to cause this catastrophe?