#1 a. (12 points) Match the following sets of data with the sentence that describes them.

i. y is a linear function of x.

Data A.

x	1	2	3	4	5	6
y	.5	2	4.5	8	12.5	18

ii. y is proportional to x^2.

Data B.

x	1	2	3	4	5	6
y	.25	.5	1	2	4	8

iii. y is inversely proportional to x.

Data C.

x	1	2	3	4	5	6
y	6	8	10	12	14	16

iv. y is an exponential function of x.

Data D.

x	1	2	3	4	5	6
y	30	15	10	7.5	6	5

b. (4 points) For data set D, is $\dfrac{d^2y}{dx^2}$ negative, zero, or positive on the interval from $x = 0$ to 6? Why?

#2 (12 points) Choose from the following terms to fill in the blanks.

"concave down"   "concave up"   "decreasing"   "horizontal"
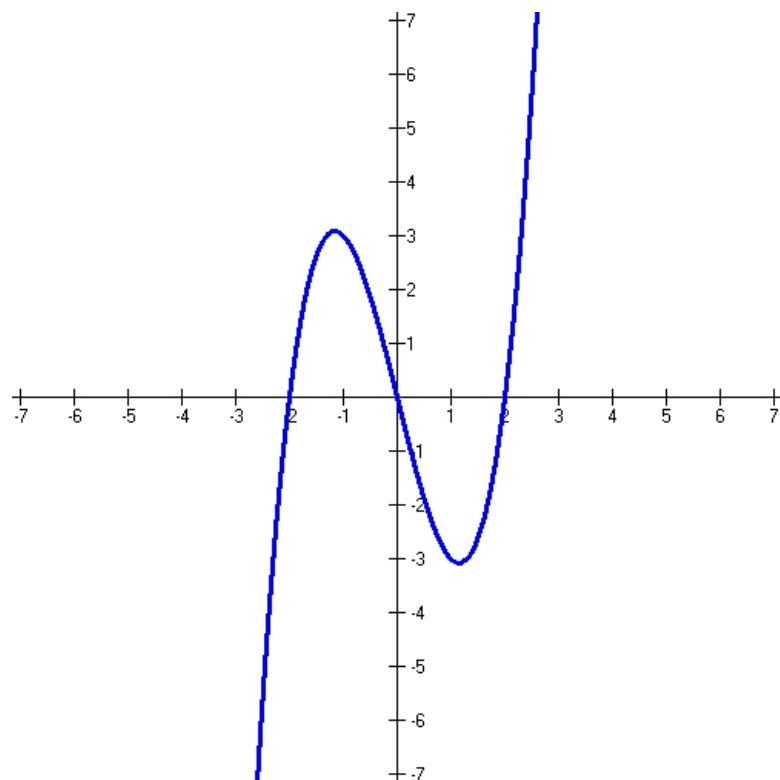
     "increasing"   "linear"   "vertical"

- $f'' > 0$ on an interval means f' is _____, so the graph of f is _____.

- $f'' < 0$ on an interval means f' is _____, so the graph of f is _____.

#3 (8 points) Solve for the equation $4e^{5x+1} = 100$ for x.

#4 (18 points) Suppose $y = f(x)$ has the following graph:

- On what interval(s) is $f > 0$?

- On what interval(s) is $f' < 0$?

- At what values of x is $f'(x) = 0$?

- On what interval(s) is $f'' > 0$?

- On what interval(s) is f increasing?

- On what interval(s) is f concave down?

- On what interval(s) is f' increasing?

#5 a. (10 points) Given that $f(4) = 10$ and $f'(4) = 3$, find the equation of the tangent line to $y = f(x)$ at $x = 4$.

b. (3 points) Use your answer from part a. to estimate $f(3.8)$.

#6 The diameter (measured in centimeters) of a tree is given by $D(t) = 3\log_{10}(t + 2)$ where t is the number of months after it was planted.

a. (5 points) Find $D(8)$. Interpret this in terms of the problem.

b. (10 points) Give $D'(8)$ to 4 decimal places. Interpret this is terms of the problem.

#7 At noon you place an unknown amount of bacteria in a jar and immediately your cell phone rings. At 1:00pm, you finally get a chance to count the bacteria in your jar and find that there are 200. You go to lunch and come back at 2:00pm and count the bacteria again and this time find 250.

   a. (9 points) Assuming exponential growth, how many bacteria did you put into the jar at noon?

   b. (9 points) Assuming linear growth, how many bacteria did you put into the jar at noon?