



ADVANCED FUNCTIONS AND MODELING

key

The questions you read next will require you to answer in writing.

1. Write your answers on separate paper.
2. Be sure to write your name on each page.

- 1 The chart below shows the amount of insulin in a person's bloodstream after a certain amount of time, t .

$$y = 10.3569929 (.9498282337)^x$$

(L1)	t (minutes)	3	15	24	45
(L2)	Units of Insulin	8.6	4.9	3.1	1.0

Create a best fit exponential function to answer the questions.

- To the nearest tenth, how many units of insulin are in the person's bloodstream at $t = 0$? $x=0, y=? (table) \rightarrow 10.4 \text{ units}$
- To the nearest percent, what is the absolute value of the percent change per minute of insulin? $(-0.95 = .05 \rightarrow 5\%)$

- 2 A geologist is analyzing the erosion of a coastline over the past five years. The table below shows the relationship.

(L1)	Time (years)	1	2	3	4	5
(L2)	Cumulative Erosion (feet)	1.01	2.81	6.51	10.14	16.32

$$r = .9800 \quad r = .9824 \quad r = .9977$$

- a) Does a linear, exponential, or power function best fit the data? Explain. $\text{power is best since its correlation coefficient is closest to 1}$
- b) Write the equation of the function that best models the data.
- c) Using the equation created, how much erosion can be expected after 8 years?

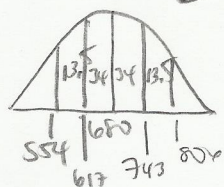
$$b) y = .9495152532 x^{1.730420077}$$

$$c) x=8 y=? (table) \rightarrow 34.692 \text{ feet}$$

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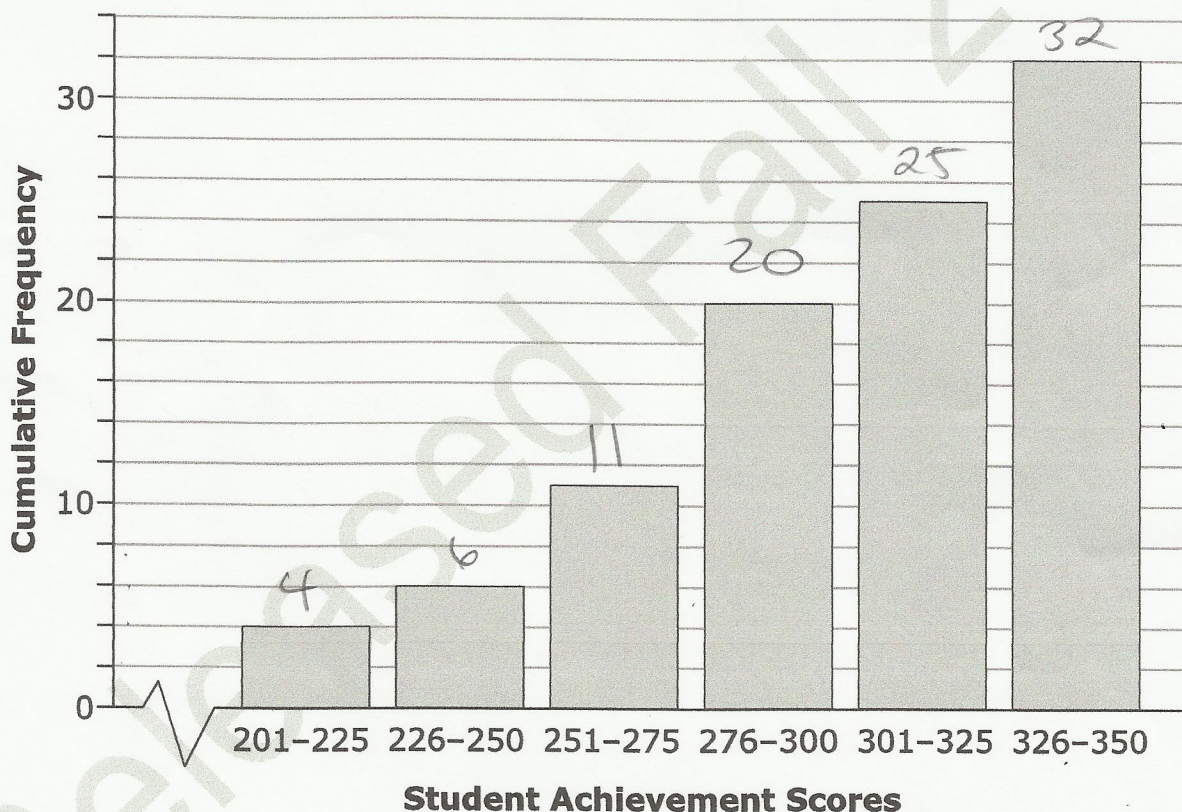
- 3 A restaurant determined that the calories of its meals are normally distributed. The mean is 680 calories with a standard deviation of 63 calories.



- Give a range of calories, centered on the mean, that includes 95% of the restaurant's meals. 554 to 806
- The cook creates a meal with 617 calories. What percentage of meals has more calories than this meal?

$$34 + 34 + 13.5 + 2.35 + .15 = \boxed{84\%}$$

- 4 The table below shows the cumulative frequency of student achievement scores for a particular class. Total = 98



- a) Which 25-point interval contains the median achievement score?
- b) How many students scored at least a 276 on the achievement test?

- a) 276-300 interval contains median
 b) $20 + 25 + 32 = 77$ students

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Key control

- 5 A professor of a statistics class has the following scores for her students: 296, 332, 290, 308, 343, 371, 336, 384, 361, 350.

$$\bar{x} = 337.1$$

$$\sigma_x = 29.8$$

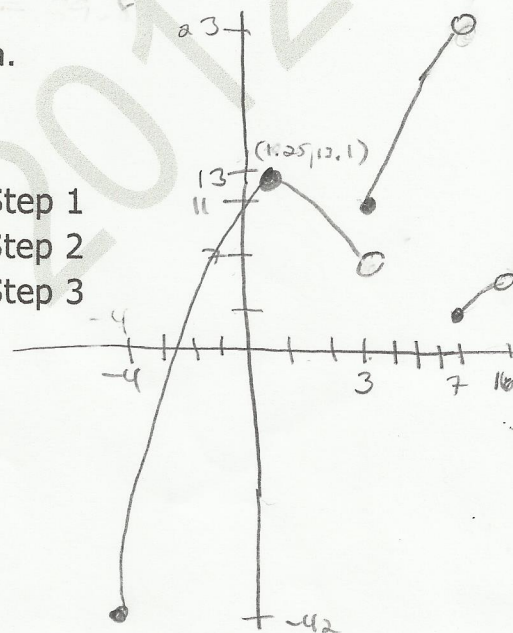
- If 10 points are added to each score, what is the new mean and standard deviation?

$$\bar{x} + 10 = 337.1 + 10 = 347.1$$

$$\sigma_x = 29.8$$

- 6 Use the piecewise function below to answer each question.

$$h(x) = \begin{cases} -2x^2 + 5x + 10 & \text{for } -4 \leq x < 3 \quad \text{Step 1} \\ 3x + 2 & \text{for } 3 \leq x < 7 \quad \text{Step 2} \\ \sqrt{2x - 5} & \text{for } 7 \leq x < 16 \quad \text{Step 3} \end{cases}$$



- What is the range for step 1? $[-42, 13.1)$
- What is the domain for the entire function? $[-4, 16)$
- What is $h(10.5)$?

$$\sqrt{2(10.5) - 5} = 4$$

- 7 For the following problem, round each answer to the nearest hundredth.

- Write the equation of the power function that passes through the points (1, 6) and (3, 14).
- Based on the above function, what is the value of x when $y = 8$?

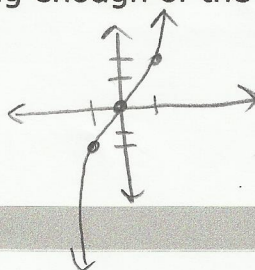
$$y = 6x^{0.7712437492}$$

$$y = 8 \quad x = ? \text{ (intersection)} \rightarrow x = 1.4520997$$

- 8 Power functions can be written in the form $f(x) = ax^b$, where $b > 1$.

- Write an equation for an odd, positive-integer power function of this form.
- Graph the equation including enough of the domain to show the graph's important features.

$$f(x) = 2x^3$$



$$D: (-\infty, \infty)$$

$$R: (-\infty, \infty)$$