

Part I. (2 points each) Write your answers on the appropriate lines in the answer column.

1. Simplify: $(-2)^4 - \frac{3 \cdot 5 - 7}{2}$ 1. _____
2. Simplify: $(4x^2)^{\frac{3}{2}}$ 2. _____
3. Write in scientific notation: 4,250,000 3. _____
4. Write in scientific notation: 0.00425 4. _____
5. Simplify: $3(2 + 4x) - 2(x - 5)$ 5. _____
6. If $G(x) = 3x - 16$, then find $G(10)$. 6. _____
7. Solve for x: $20 = 4 \ln(e^{-x})$ 7. _____
8. Solve for y: $\frac{x}{4} + \frac{3y}{2} = 9$ 8. _____
9. Find an equation for the line passing through the points (6,3) and (10,-5). 9. _____
10. Find an equation for a power function containing the points (0,0), (1,10), and (2, 80) 10. _____
11. Find an equation for an exponential function containing the points (0,10), (1, 20), and (2, 40). 11. _____
12. Solve for x: $200 = 100e^{0.06x}$ 12. _____
13. Solve for x: $20 = \frac{3(x-2)}{2} - 10$ 13. _____
14. Simplify: $\sqrt{100x^{100}}$ 14. _____
15. Find x and y so that $x + 2y = 27$ and $y = 2x + 1$. 15. _____

Part II (6 points each). Show your work in the spaces provided. *Identify any variables you introduce and express your conclusions using appropriate sentences.* In each case, either explain how you solved the problem or show your work in the space provided. Express all numerical values to the nearest 0.01

16. A company estimates that its net profit N (in dollars) it would receive by spending A dollars per month on advertising is given by the function $N(A) = 5A - 0.0002A^2$.

a. Sketch a graph of the net profit function. Label your axes and any intercepts and maximum points.

b. At what level of spending on advertising would the net profit be maximum? What would be that maximum profit?

c. What level(s) of advertising would result in a zero net profit?

17. The population of a country is now 50 million and is growing at an annual compounding rate of 5% per year. Assume that the country's population will continue to grow at the present rate and write a rule for a function that will give the country's population as a function of time, in years, from the present. Show how to use your function to estimate the country's population in five years.

18. Show how to determine an equation for a parabola that fits the following description:

The minimum value of $y = 3$ occurs when $x = 5$. But when $x = 0$, $y = 103$.

19. Biologists have found a functional model to express the relationship between the weight W (in pounds) of large flying birds and their wingspan S (in feet). This relationship can be represented by the power function

$$W = 0.15S^{\frac{9}{4}}.$$

- Sketch a rough graph of this relationship. Use S as your independent variable. Label your axes and show the correct qualitative properties of the graph.
 - The wingspan of a condor is about 10 feet. According to this model, determine the approximate weight of a condor.
 - A bald eagle weighs about 16 pounds. Use the relationship described in this problem to estimate its wingspan.
20. Specify the type of function that will best fit the data below and specify a rule for the particular function you think best fits the data. In each case calculate the first differences and the ratios of successive terms and explain how you determined the type of function you specified. Sketch the shape of the graph and determine the value of y when $x = 10$.

x	y	Δy	Ratio
0	1024		
1	768		
2	576		
3	432		
4	324		