**Assigned: Thursday 4/19 DUE ON WEDNESDAY 4/25, MUST SHOW WORK FOR CREDIT**

**UNIT 4: MODELING AND ANALYZING EXPONENTIAL FUNCTIONS Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |
| --- | --- |
| **Question** | **Answer** |
| **Create Equations That Describe Numbers or Relationships** |
| **1. An amount of $1,000 is deposited into a bank account that pays 4% annual interest. If there are no other withdrawals or deposits, what will be the balance of the account after 3 years?** |  |
| **2. The city of Arachna has a spider population that has been doubling every year. If there are about 100,000 spiders this year, how many will there be 4 years from now?** |  |
| **3. A certain population of bacteria has an average growth rate of 0.02 bacteria per hour. The formula for the growth of the bacteria’s population is *A* 0= *P*(2.71828)0.02*t* , where *P*0 is the original population, and *t* is the time in hours. If you begin with 200 bacteria, about how many bacteria will there be after 100 hours?** | **A.** 7**B.** 272**C.** 1,478**D.** 20,000 |
| **4. Pete withdraws half his savings every week. If he started with $400, what rule be written for how much Pete has left each week?** |  |
| **5. Consider the number of sit-ups Clara does each week as listed in the sequence 3, 6, 12, 24, 48, 96, 192.** | a**) Is this an arithmetic or geometric sequence?****b) What is the explicit formula?****c) What is the recursive rule?** |
| **6. A scientist collects data on a colony of microbes. She notes these numbers:**

|  |  |
| --- | --- |
| **Day** | **an** |
| **1** | **800** |
| **2** | **400** |
| **3** | **200** |
| **4** | **100** |
| **5** | **50** |

 | **What function can she use to model the population size?** |
| **6.** The temperature of a large tub of water that is currently at 100° decreases by about 10% each hour. **Part A:** Write an explicit function in the form *f*(*n*) = *a* · *bn* to represent the temperature, *f*(*n*), of the tub of water in *n* hours.**Part B:** A recursive function in the form *f*(*n*) = *r*(*f*(*n* – 1)), where *f*(1) = 100, can be written for the temperature problem. What recursive function represents the temperature, *f*(*n*), of the tub in hour *n*? |  |
| **7.** |  |
| **8. The points (0, 1), (1, 5), (2, 25), (3, 125) are on the graph of a function. Which equation represents that function?****A.** **B.** **C.** **D.**  |  |
| **Build New Functions from Existing Functions** |
| **9. If *,* how will *g*(*x*) = *f*(*x*) + 2 and *h*(*x*) = *f*(*x*) – 3 compare?** | [image] |
| **10. If *,* how will *g*(*x*) = 3*f*(*x*) , *h*(*x*) = *f*(*x*), and compare?** | [image] |
| **11. For the function find the function that represents a 5 unit translation up of the function.** |  |
| **12. Given the function *f*(*x*) complete each of the following:****a. Compare *f*(*x*) to 3*f*(*x*).****b. Compare *f*(*x*) to *f*(3*x*).****c. Draw the graph of -*f*(*x*).****d. Which has the fastest growth rate: *f*(*x*), 3*f*(*x*), or -*f*(*x*)?** | [image] |
| 13. **Which function shows the function *f*(*x*) = 3*x* being translated 5 units to the left?**  | **A.** *f*(*x*) = 3*x* – 5 **B.** *f*(*x*) = 3(*x* + 5) **C.** *f*(*x*) = 3(*x* – 5) **D.** *f*(*x*) = 3*x* + 5  |
| 14. **Which function shows the function *f*(*x*) = 3*x* being translated 5 units down?** | **A.** *f*(*x*) = 3*x* – 5 **B.** *f*(*x*) = 3(*x* + 5) **C.** *f*(*x*) = 3(*x* – 5) **D.** *f*(*x*) = 3*x* + 5 |
| Understand the Concept of a Function and Use Function Notation |
| **15. Given *f*(*x*) = 2(3)*x*, find *f*(7).** |  |
| **16. If *g*(6) = 2(6) + 1, what is *g*(*x*)?** |  |
| **17. If *f*(–2) = 4(–2), what is *f*(*b*)?** |  |
| **18. Graph .** | **[image]** |
| **19. A population of bacteria begins with 2 bacteria on the first day and triples every day. The number of bacteria after x days can be represented by the function P(x) = 2(3)x .**  | **a. What is the common ratio of the function?** **b. What is a1 of the function?** **c. Write a recursive formula for the bacteria growth.** **d. What is the bacteria population after 10 days?** |
| **20. Consider the first six terms of the following sequence: 1, 3, 9, 27, 81, 243, . . .** **a. What is *a*1? What is *a*3?** **b. What is the reasonable domain of the function?** **c. If the sequence defines a function, what is the range?** **d. What is the common ratio of the function?**  |  |
| **21. The function f(n) = –(1 – 4n) represents a sequence. Create a table showing the first five terms in the sequence. Identify the domain and range of the function.** |  |
| 22. **Consider this pattern. Which function represents the sequence that represents the pattern?** |  |
| 23. **Which function is modeled in this table?**  |  |
| **24. Which explicit formula describes the pattern in this table?** |  |
| 25.  |  |
| **Interpret Functions That Arise in Applications in Terms of the Context** |
| **26. Find the following features of**  | Domain:Range:x-intercept:y-intercept:Interval of Increase:Interval of Decrease:Maximum:Minimum:Rate of Change:Asymptote: |
| **27. The amount accumulated in a bank account over a time period *t* and based on an initial deposit of $200 is found using the formula . Time, *t*, is represented on the horizontal axis. The accumulated amount, *A*(*t*), is represented on the vertical axis.** **a. What are the intercepts of the function?****b. What is the domain of the function?****c. Why are all the *t* values non-negative?****d. What is the range of the function?** |  |
| **28. Consider two exponential functions, If and . Compare the key features of the two functions.**

|  |  |
| --- | --- |
| f(x) | g(x) |
| Domain:Range:x-intercept:y-intercept:Interval of Increase:Interval of Decrease:Rate of Change:Asymptote: | Domain:Range:x-intercept:y-intercept:Interval of Increase:Interval of Decrease:Rate of Change:Asymptote: |

 | [image] |
| **29. A population of squirrels doubles every year. Initially, there were 5 squirrels. A biologist studying the squirrels created a function to model their population growth: P(t) = 5(2t), where t is the time in years. The graph of the function is shown.****What is the range of the function?****A**. any real number**B**. any whole number greater than 0**C**. any whole number greater than 5**D**. any whole number greater than or equal to 5 |  |
| **30. The function graphed on this coordinate grid shows f(x), the height of a dropped ball in feet after its xth bounce. On which bounce was the height of the ball 10 feet?****A.** bounce 1 **B.** bounce 2 **C.** bounce 3 **D.** bounce 4  |  |
| Analyze Functions Using Different Representations |  |
| **31. Consider . Compare the rates of change, y-intercepts, and end behaviors of each graph.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| End Behavior: | As x increases, f(x) \_\_\_\_\_\_\_\_.As x decreases, f(x) \_\_\_\_\_\_\_\_\_. | As x increases, f(x) \_\_\_\_\_\_\_\_.As x decreases, f(x) \_\_\_\_\_\_\_\_\_. | As x increases, f(x) \_\_\_\_\_\_\_\_.As x decreases, f(x) \_\_\_\_\_\_\_\_\_. |
| y-intercept |  |  |  |
| Rate of Change |  |  |  |

 | [image] |
| **32. Two quantities increase at exponential rates. This table shows the value of Quantity A, f(x), after x years.**This function represents the value of Quantity B, *g*(*x*), after *x* years. *g*(*x*) = 50(2)*x* Which quantity will be greater at the end of the fourth year and by how much? |  |
| **33. Look at the graph. Which equation represents this graph?** |  |