Unit 5: Comparing Linear, Quadratic, and Exponential Functions

The tables below each represent a different function. Use these functions to answer
questions 1 – 6.

f(x)

x	-2	-1	0	1	2
f(x)	14	9	6	5	6

g(x)

x	-2	-1	0	1	2
f(x)	9	5	1	-3	-7

h(x)

x	-2	-1	0	1	2
f(x)	0.25	1	4	16	64

_____ 1) What is the equation of the linear function?

_____ 2) What is the equation of the quadratic function?

_____ 3) What is the equation of the exponential function?

_____ 4) Which function has the smallest y intercept?

_____ 5) Which function has a common difference?

_____ 6) Which function has a common ratio?

_____ 7) What type of function would represent the following situation: *Jack has $200 in
the bank. He hopes to increase his savings by $50 a month when he starts his new job.*

_____ 8) If $k(x) = 4^{x+3} + 2$, what is the average rate of change for the interval $-2 \le x \le 1$?

_____ 9) Last August, McClure Middle school's temperature was 88 degrees inside. The air
conditioner cooled the building at a rate of 5% per hour. What type of function is this?

_____ 10) 8th grade at MMS has seen an increase of students by 7 students
        each year. 8th grade at DMS has seen a decrease in the enrollment of
        students at a rate of 8% each year.

        In how many years will both grades have approximately the same number of
        students enrolled if MMS had a initial enrollment of 400 8th graders, and DMS
        started with 600 8th graders?

_____ 11) Given the parent functions $f(x) = 4^x$, $g(x) = 5x^2$, and $h(x) = 12x$, which function is
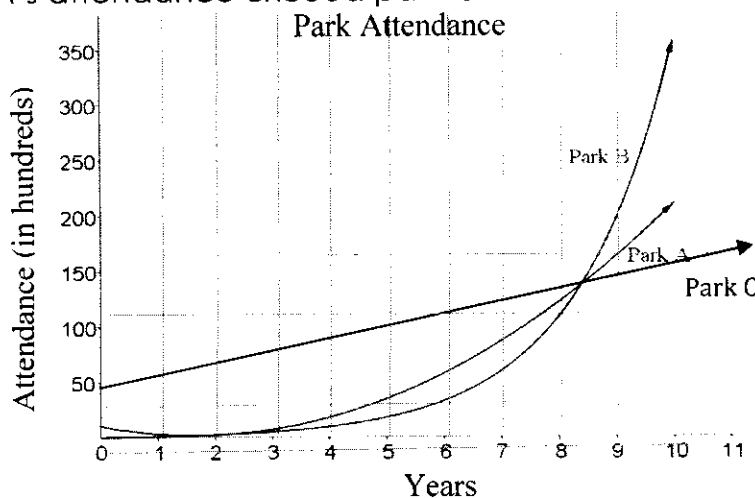   greatest at $x = 2$?

_____ 12) A baby bird flies up from his next 6 feet the first second, 12 feet the next second, 22 feet the third second, and so on. What type of function is this?

Directions: Use the graph to the right to select the best answer for questions 16 – 18.

_____ 13) After how many years does Park A's attendance exceed park C.

_____ 14) Which park has the highest attendance the 8th year?

_____ 15) When do all 3 parks have the same attendance?

Park Attendance

Attendance (in hundreds)

350
300
250
200
150
100
50

0 1 2 3 4 5 6 7 8 9 10 11

Park B
Park A
Park C

Years

Use the following situation to select the best answer to questions 19 – 20. *Mr. Rat Trap is catching squirrels in attics. On the first day, he collects 3 squirrels. On the second day, he collects 9 squirrels. On the third day, he collects 27 squirrels. He continues to collect mice at this rate for a total of 6 days.*
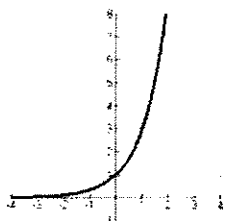
_____ 16) How many squirrels will he collect on the 6th day?

_____ 17) What type of sequence represents the situation described?

   a) arithmetic   b) geometric   c) quadratic   d) none of these

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For each of the following tables, graphs, and equations, tell whether the function is positive linear, negative linear, quadratic, exponential growth, exponential decay, or none of these.

_____ 18)

_____ 19) f(x) = x² + 10x -2

_____ 20) y = 2(0.3)ˣ

_____ 21) g(x) = -9x + 2

_____ 22) If there are 20 termites at the beginning of summer and they are tripling everyday, write an explicit rule representing this situation and state whether it is arithmetic **or** geometric. How many termites will there be after 5 days? **(3 answers)**

_____ 23) Write the first 3 terms of the sequence represented recursively by $a_1 = 4$ and $a_n = a_{n-1}(3)$. State whether it is arithmetic **or** geometric.

Comparing Functions

Use the tables below to answer questions 1-7.

x	$f(x)$
1	5
2	2
3	1
4	2
5	5

x	$g(x)$
1	-12
2	-9
3	-6
4	-3
5	0

x	$h(x)$
1	1
2	2
3	4
4	8
5	16

1. Which function is quadratic?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. none of these

2. What is the equation of the linear function? Assume y will represent $f(x)$, $g(x)$, or $h(x)$.

    A. $y = 3x + 7$ B. $y = -3x + 7$ C. $y = -3x + 15$ D. $y = 3x - 15$

3. Which function has the greatest y-intercept?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. they are all equal

4. Which function has a common ratio?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. none of these

5. Which function has the greatest average rate of change over the interval $4 \le x \le 5$?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. they are all equal

6. Which function increases over the entire function?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. none of these

7. Which function has both an interval of increase and an interval of decrease?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. none of these

What type of function could represent each situation?

7. Paul rides in a taxi. He pays $8 to start and then $1.50 for each mile.

    A. linear   B. quadratic   C. exponential   d. none of these

8. Suzi starts out running 100 yards. Each day she doubles the distance she runs.

    A. linear   B. quadratic   C. exponential   d. none of these

9. Jane's pay has a starting salary of $28,000. In addition, she earns 4.5% commission on the items she sells.

    A. linear   B. quadratic   C. exponential   d. none of these

10. Bradley gets a job where his starting salary is $30,000 and gets a 12% pay raise each year.

    A. linear   B. quadratic   C. exponential   d. none of these

11. Given the function $f(x) = x^2 + 3$, what is the average rate of change over the interval $1 \leq x \leq 2$.

    A. 4   B. 3   C. 2   D. 1

12. The population of Tiny Town is increasing by 5 people each year, with a beginning population of 75. The population of Center City had a decay factor of .95 with an initial population of 300.

Write an explicit rule to model the population of each and determine the number of years at which the two will have *approximately* the same population.
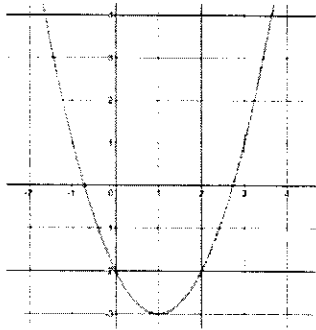
    A. 10 years   B. 14 years   C. 18 years   D. 22 years

13. Given the functions $f(x) = 6x - 5$ and $g(x) = x^2 + 2x - 2$, which function is greater when $x = 3$?

    A. $f(x)$ B. $g(x)$ C. they are equal   D. cannot be determined

Use the functions represented in the graph, table and equation to answer #14-18.

$f(x)$		x	$g(x)$		$h(x) = 6\left(\dfrac{1}{2}\right)^{x+4} - 3$
		-1	8		
		0	6		
		1	4		
		2	2		
		3	0		
		4	-2		

14. Which function has a maximum value?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. none of these

15. Which function has the greatest y-intercept?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. both $g(x)$ and $h(x)$

16. Which function has an asymptote at $y = -3$?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. none of these

17. Which function has an axis of symmetry at $x = 1$?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. none of these

18. Which function has a common difference?

    A. $f(x)$ B. $g(x)$ C. $h(x)$ D. none of these

Determine which type of sequence could be used to model this situation and write an explicit rule.

19. Your match box car has traveled 5 feet after one second, 10 feet after two seconds, and 15 feet after three seconds.

    A. Arithmetic; $a_n = 5n$ B. Arithmetic; $a_n = 5 + 5n$

    C. Geometric; $a_n = 5(5)^{n-1}$ D. Geometric; $a_n = 5(2)^{n-1}$

20. A beetle population triples each week. After the first week there are 27 beetles.

    A. Arithmetic; $a_n = 3n$ B. Arithmetic; $a_n = 3n + 9$

    C. Geometric; $a_n = 27(3)^{n-1}$ D. Geometric; $a_n = 3(9)^{n-1}$