7.1 Exponential Growth

Algebra 1

Name: Solutions

Practice

Are the following functions linear, exponential or neither?

1. $f(x) = 5^x$ Exponential	2. $f(t) = 3 \cdot 4^t$ Exponential	3. $f(n) = 10n^{1.9}$ Neither	4. $f(x) = 1.9x$ Linear	5. $f(a) = 6(1.9)^a$ Exponential
6. $f(w) = w^4$ Neither	7. $f(x) = 3x^6$ Neither	8. $f(t) = 5 \cdot 8^t$ Exponential	9. $f(x) = -4(2)^x$ Exponential	10. $f(r) = -3r$ Linear

Create a model (equation) for each scenario.

11. A baseball card is worth \$50 and its value increases at a rate of 23.5% per year.

$y = 50(1.235)^x$

12. Mr. Bean's signature is currently worth \$0.02, but it is increasing at a rate of 0.5% per year.

$y = 0.02(1.005)^x$

13. A plague of mice has hit Mr. Kelly's garage! Starting with only 30 mice, they can increase by 650% every month.

$y = 30(7.5)^x$

14. During a Cleveland Brown's game, Sully's blood pressure rises 7.8% each quarter. At kickoff, his systolic blood pressure is 120.

$y = 120(1.078)^x$

15. A three-bedroom house in Brustville sold for \$190,000. If housing prices are expected to increase 1.8% annually in that town, write an explicit formula that models the price of the house in t years.

$P(t) = 190{,}000(1.018)^t$

Find the price of the house in 5 years.

$P(5) = \$207{,}726.78$

16. A local college has increased its number of graduates by a factor of 1.045 over the previous year for every year since 1997. In 1997, 924 students graduated. What explicit formula models this situation?

"G" is # of graduates

"t" is # of years since 1997.

$G(t) = 924(1.045)^t$

Approximately how many students will graduate in 2014?

$G(17) = 1{,}953$

17. In 2013, a research company found that smartphone shipments (units sold) were up 32.7% worldwide from 2012, with an expectation for the trend to continue. 959 million units were sold in 2013. Write an explicit formula that models the number of smartphones sold since 2013.

"S" is # of smartphones sold (in millions)

"t" is # of years since 2013.

$S(t) = 959(1.327)^t$

How many smartphones can be expected to sell in 2019 at the same growth rate? Can this trend continue? Why or why not?

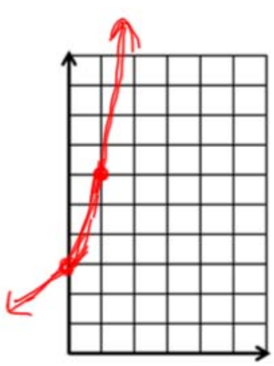
$S(6) \approx 5236 \rightarrow$ About 5,236,000,000 phones

This trend can't continue because the world's population is not infinite. At some point, there will not be anyone left to by smartphones.

Sketch the graph by filling out a T-chart. Find AT LEAST THREE points (even if they can't all fit on the graph).

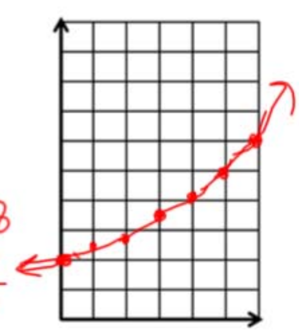
18. $y = 3(2)^x$

x	y
0	3
1	6
2	12



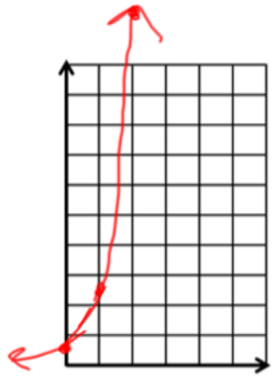
19. $y = 2(1.2)^x$

x	y
0	2
1	2.4
2	2.88
3	3.46
4	4.15



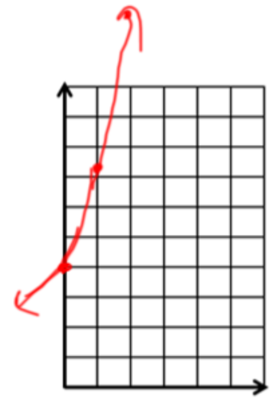
20. $f(x) = \frac{1}{2}(5)^x$

x	y
0	0.5
1	2.5
2	12.5



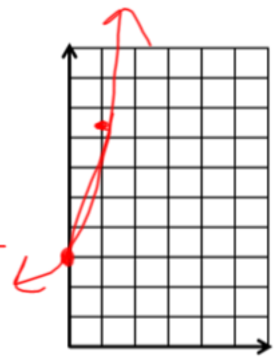
21. $f(x) = 4(1.8)^x$

x	y
0	4
1	7.2
2	12.96



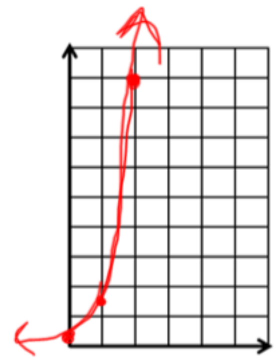
22. $y = 3(2.5)^x$

x	y
0	3
1	7.5
2	18.75



23. $f(x) = \frac{1}{4}(6)^x$

x	y
0	0.25
1	1.5
2	9



Given the following table of values, create an equation that fits these points.

24.

x	0	1	2	3
y	4	48	576	6,912

$\cdot 12$ $\cdot 12$ $\cdot 12$

$\boxed{y = 4(12)^x}$

25.

x	0	1	2	3
y	.75	1.2	1.92	3.072

$\cdot 1.6$ $\cdot 1.6$ $\cdot 1.6$

$\boxed{y = 0.75(1.6)^x}$

26.

x	0	1	2	3
y	0.2	2.1	22.05	231.525

$\cdot 10.5$ $\cdot 10.5$ $\cdot 10.5$

$\boxed{y = 0.2(10.5)^x}$

27.

x	0	1	2	3
y	-7	-9.1	-11.83	-15.379

$\cdot 1.3$ $\cdot 1.3$ $\cdot 1.3$

$\boxed{y = -7(1.3)^x}$

For each equation, identify the initial value (I.V.) and the percent increase.

28. $y = 5(1.05)^x$
$1+r=1.05$
$r=0.05$
I.V. 5 % Inc: 5%

29. $y = -2(2.1)^x$
$1+r=2.1$
$r=1.1$
I.V. -2 % Inc: 110%

30. $y = 4.5(5.565)^x$
$1+r=5.565$
$r=4.565$
I.V. 4.5 % Inc: 456.5%

31. $y = (1.051)^x$
$1+r=1.051$
$r=0.051$
I.V. 1 % Inc: 5.1%

32. $y = 7.1(7.01)^x$
$1+r=7.01$
$r=6.01$
I.V. 7.1 % Inc: 601%

33. $y = -6(2.09)^x$
$1+r=2.09$
$r=1.09$
I.V. -6 % Inc: 109%

34. $y = 7(3)^x$
$1+r=3$
$r=2$
I.V. 7 % Inc: 200%

35. $y = 110(1.104)^x$
$1+r=1.104$
$r=0.104$
I.V. 110 % Inc: 10.4%