1. an irrational number that is approximately 2.718281828

2. exponential growth; A function of the form $y = ae^{rx}$ shows growth when $a > 0$ and $r > 0$. In this function, $a = \frac{1}{3}$ and $r = 4$.

3. e^8

4. e^2

5. $\dfrac{1}{2e}$

6. $9e^3$

7. $625e^{28x}$

8. $\dfrac{64}{e^{6x}}$
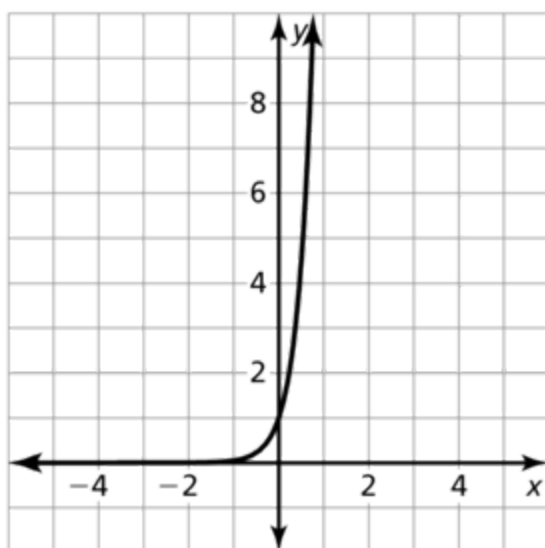
9. $3e^{3x}$

10. $2e^{4x}$

11. $e^{-5x + 8}$

12. $e^{2x + 7}$

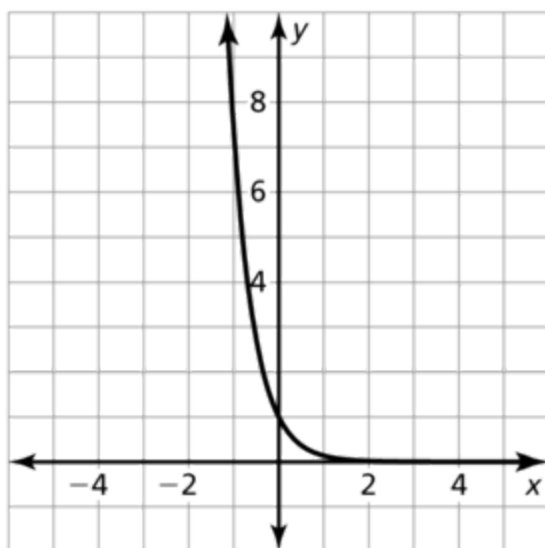13. The 4 was not squared; $(4e^{3x})^2 = 4^2e^{(3x)(2)} = 16e^{6x}$

14. The exponent of the denominator was added, not subtracted, from the exponent of the numerator;

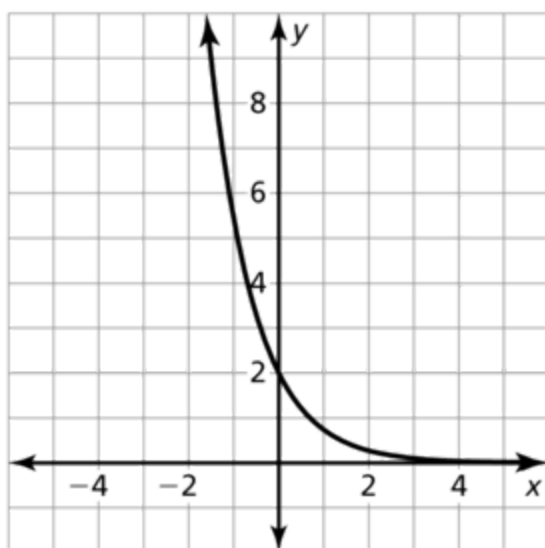$\dfrac{e^{5x}}{e^{-2x}} = e^{5x - (-2x)} = e^{5x + 2x} = e^{7x}$
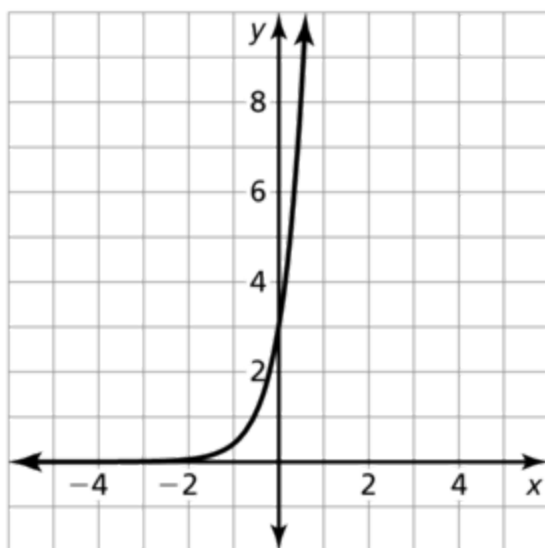
15. exponential growth
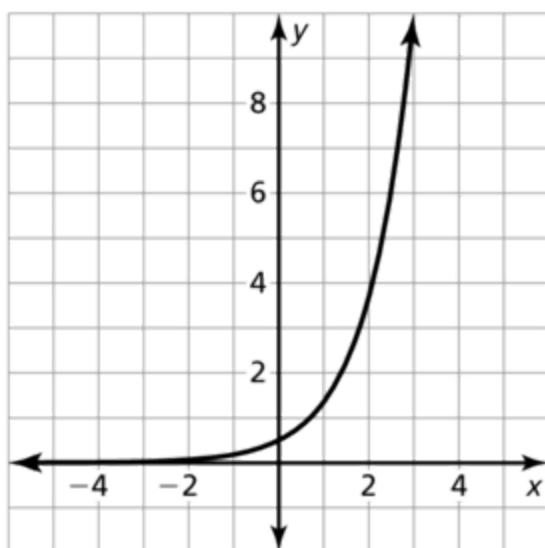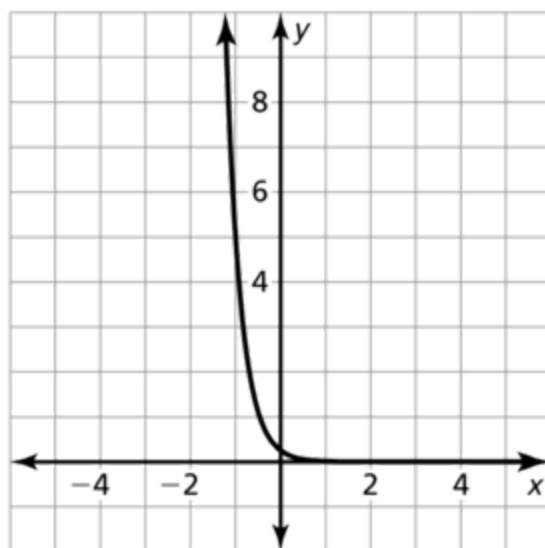

16. exponential decay

17. exponential decay
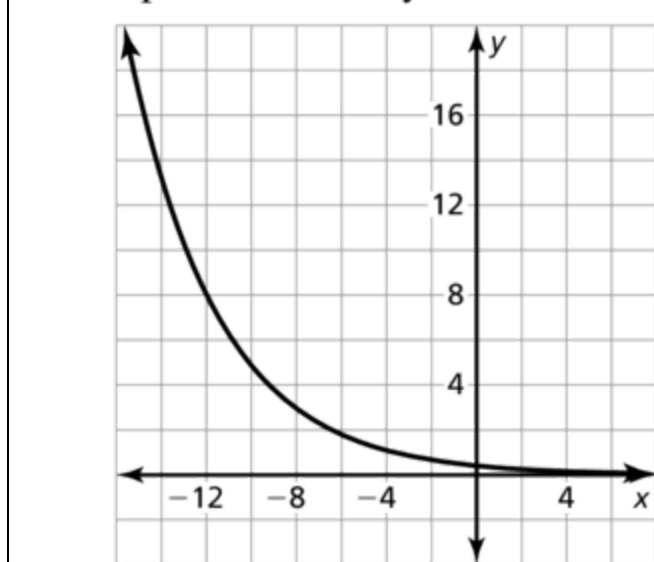

18. exponential growth
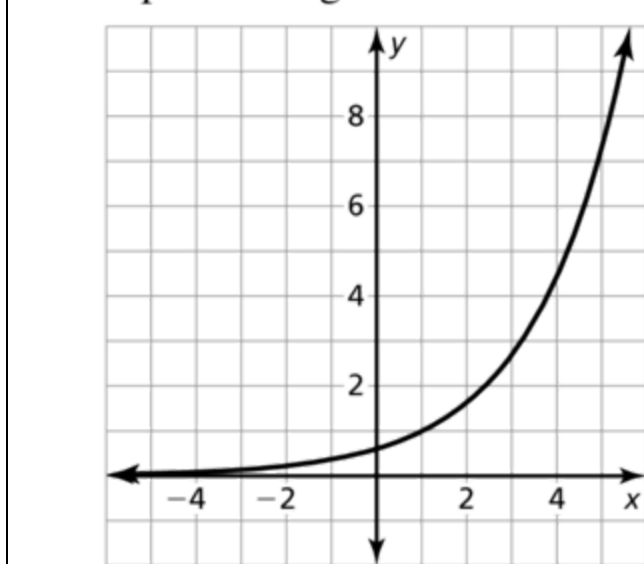
19. exponential growth

20. exponential decay

21. exponential decay

22. exponential growth

23. D; The graph shows growth and has a y-intercept of 1.

24. A; The graph shows decay and has a y-intercept of 1.

25. B; The graph shows decay and has a y-intercept of 4.

26. C; The graph shows growth and has a y-intercept of 0.75.
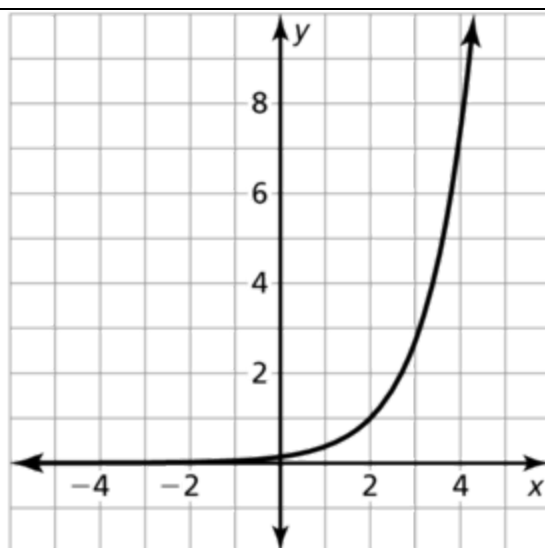
27. $y = (1 - 0.221)^t$; 22.1% decay

28. $y = (1 - 0.528)^t$; 52.8% decay

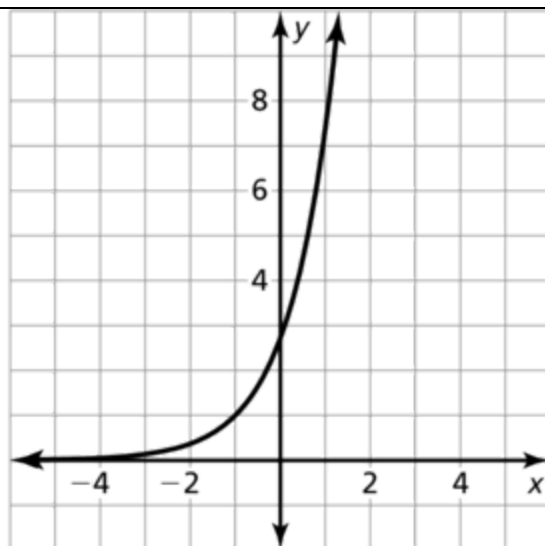**29.** $y = 2(1 + 0.492)^t$; 49.2% growth

30. $y = 0.5(1 + 1.226)^t$; 122.6% growth
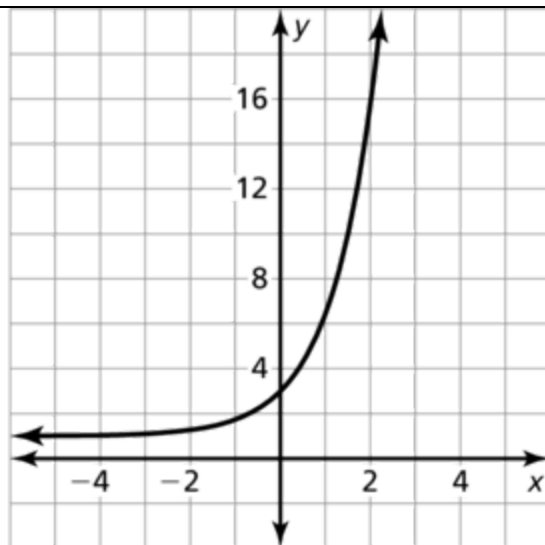
31.

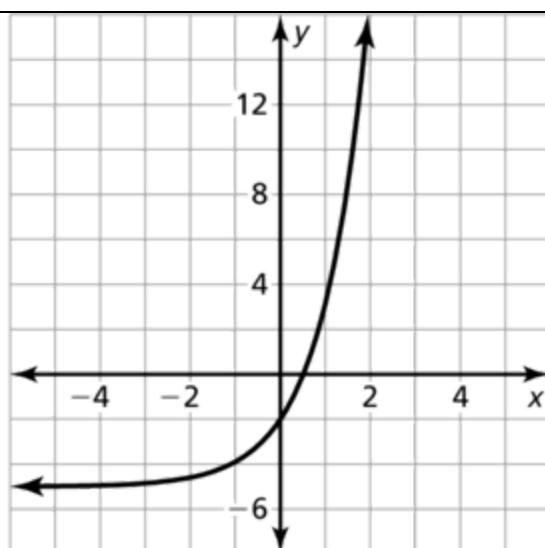domain: all real numbers, range: $y > 0$

32.

domain: all real numbers, range: $y > 0$

33.

domain: all real numbers, range: $y > 1$

34.

domain: all real numbers, range: $y > -5$

35. the education fund; the education fund

36. sodium-22; tritium

37. *Sample answer: $a = 6$, $b = 2$, $r = -0.2$, $q = -0.7$*

38. Let $m = \dfrac{n}{r}$, so $n = mr$ and $\dfrac{r}{n} = \dfrac{1}{m}$.

Substituting into $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$ gives $A = P\left(1 + \dfrac{1}{m}\right)^{mrt}$

which can be written as $A = P\left[\left(1 + \dfrac{1}{m}\right)^{m}\right]^{rt}$. By definition,

$\left(1 + \dfrac{1}{m}\right)^{m}$ approaches e as m approaches $+\infty$. So, the

equation becomes $A = Pe^{rt}$.

39. no; e is an irrational number. Irrational numbers cannot be expressed as a ratio of two integers.

40. no; The value of $f(x)$ at $x = 1000$ is too small for the calculator to display, so the calculator rounds the value to 0. The function $f(x) = e^{-x}$ has no x-intercept, but $f(x) \to 0$ as $x \to \infty$.
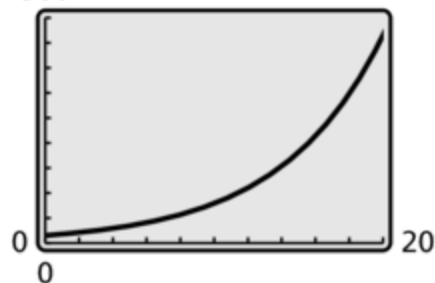
41. account 1; With account 1, the balance would be

$A = 2500\left(1 + \dfrac{0.06}{4}\right)^{4 \cdot 10} \approx \$4535.05$. With account 2, the

balance would be $A = 2500e^{0.04 \cdot 10} \approx \$3729.56$.

42. a. ∞

b. -3

43. **a.** $N(t) = 30e^{0.166t}$

b.

900

0
0   20

c. At 3:45 P.M., it has been 2 hours and 45 minutes, or 2.75 hours, since 1:00 P.M. Using the *trace* feature of the calculator, type 2.75 to find the point (2.75, 47.356183). At 3:45 P.M., there are about 47 cells.
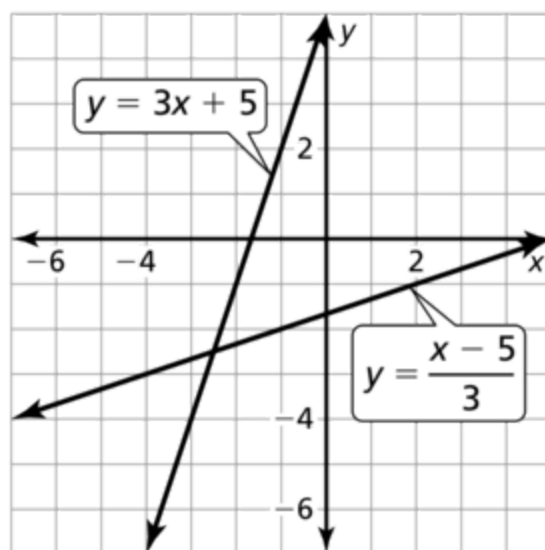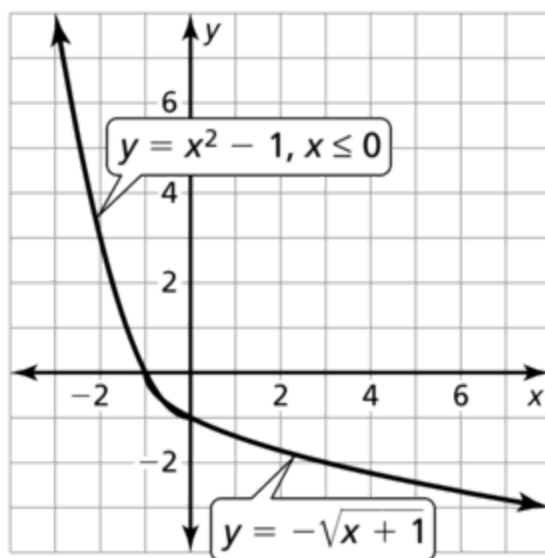
44. 6×10^{-3}

45. 5×10^{3}

46. 2.6×10^{7}

47. 4.7×10^{-8}

48. $y = \dfrac{x - 5}{3}$

$y = 3x + 5$

$y = \dfrac{x - 5}{3}$

49. $y = -\sqrt{x+1}$

$y = x^2 - 1, x \le 0$

$y = -\sqrt{x+1}$

50. $y = x^2 - 6, x \ge 0$

$y = \sqrt{x+6}$

$y = x^2 - 6, x \ge 0$

51. $y = \sqrt[3]{x + 2}$