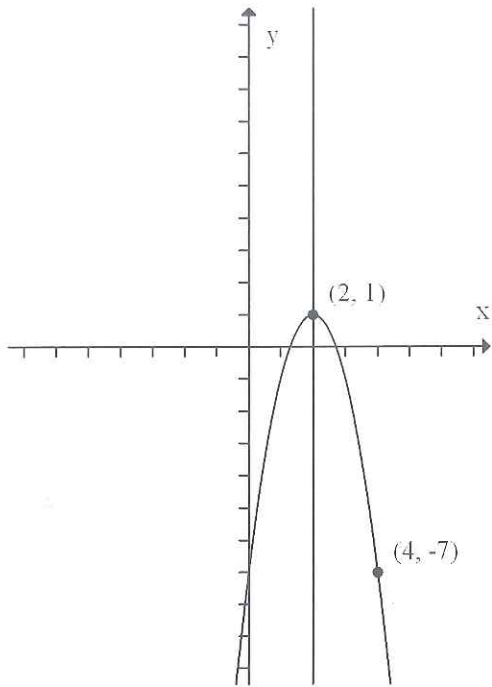


28. Find a formula for the parabola:



$$\begin{aligned}y &= a(x-h)^2 + k \\y &= a(x-2)^2 + 1 \\-7 &= a(4-2)^2 + 1 \\-7 &= 4a + 1 \\-8 &= 4a \\-2 &= a\end{aligned}$$

$$y = -2(x-2)^2 + 1$$

29. The populations of 4 species of animals are given by the following equations:

$$P_1 = 420(0.74)^t$$

$$P_2 = 960(1.23)^t$$

$$P_3 = 580(0.94)^t$$

$$P_4 = 800(1.05)^t$$

Which species are shrinking in size?

- A) P_4
- B) P_3
- C) P_2
- D) P_1

30. The populations of 4 species of animals are given by the following equations:

$$P_1 = 210(0.82)^t$$

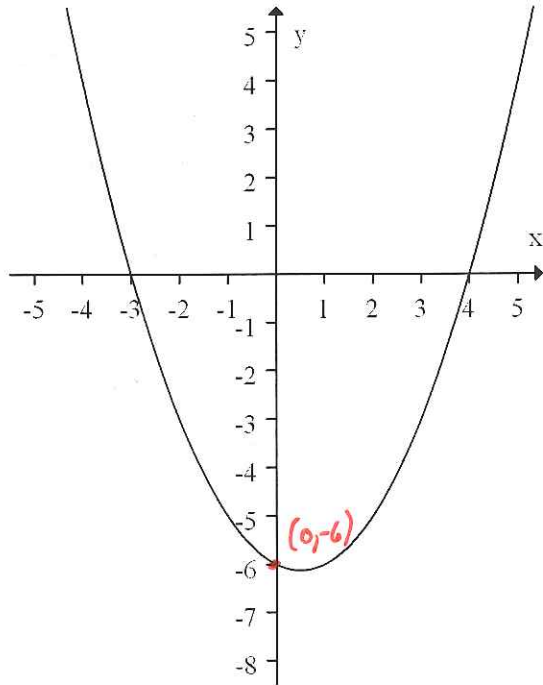
$$P_2 = 220(1.08)^t$$

$$P_3 = 500(0.9)^t$$

$$P_4 = 610(1.05)^t$$

What is the largest initial population of the 4 species? P_4

31. Find a formula for the parabola



$$y = a(x-4)(x+3)$$

$$-6 = a(0-4)(0+3)$$

$$-6 = -12a$$

$$\frac{1}{2} = a$$

$$y = \frac{1}{2}(x-4)(x+3)$$

32. Find the vertex form of $f(x) = x^2 + 2x - 10$ by completing the square.

$$\begin{aligned} f(x) &= (x^2 + 2x) - 10 \\ &= (x^2 + 2x + 1) - 10 - 1 \\ f(x) &= (x+1)^2 - 11 \end{aligned}$$

33. A population has size 3100 at time $t = 0$, with t in years. If the population grows by 50 people per year, what is the formula for P , the population at time t ?

A) $P = 3100(1.5)^t$

B) $P = 3100 + 50t$

C) $P = 3100(0.5)^t$

D) $P = 3100(1.5)^t$

34. Each of the functions in the table below is increasing, but each increases in a different way. One is linear, one is exponential, and one is neither.

t	$f(t)$	$g(t)$	$h(t)$
1	24.48	14	30
2	25.58	24	45.00
3	26.68	33	67.50
4	27.78	41	101.25
5	28.88	48	151.88
6	29.98	54	227.81

Which one is linear: f , g , or h ?

f

35. The price of an item increases due to inflation. Let $p(t) = 52.50(1.028)^t$ give the price of the item as a function of time in years, with $t = 0$ in 2004. Estimate $p^{-1}(145)$ to 2 decimal places.

GRAPH

$$y_1 = 145$$

$$y_2 = 52.50(1.028)^x$$

$$t = 36.79$$

$$145 = 52.50(1.028)^t$$

$$\frac{145}{52.50} = 1.028^t$$

$$\log\left(\frac{145}{52.50}\right) = \log(1.028^t)$$

$$\log\left(\frac{145}{52.50}\right) = t \log 1.028$$

$$\frac{\log\left(\frac{145}{52.50}\right)}{\log 1.028} = t$$

$$36.79 = t$$

36. Suppose Taylor win \$10,000 in a lottery. If she invests half in a CD earning 4.2% annual interest compounded quarterly and the rest in a savings account earning 3.8% annual interest compounded monthly. How much money does she have after 10 years?

$$5000 \left(1 + \frac{0.042}{4}\right)^{4 \cdot 10} + 5000 \left(1 + \frac{0.038}{12}\right)^{12 \cdot 10}$$

$$\$7593.16 + \$7307.03$$

$$\boxed{\$14,900.19}$$

or \$14,900.20 if considered one account

37. You invest \$5000 in an account earning 2.7% annual interest, compounded continuously. After how many years is the investment worth \$13,000? Round your answer to two decimal places, if necessary.

Graph: $13,000 = 5000e^{.027t}$

$$t = 35.39 \text{ years}$$

-OR-

$$13,000 = 5000e^{.027t}$$

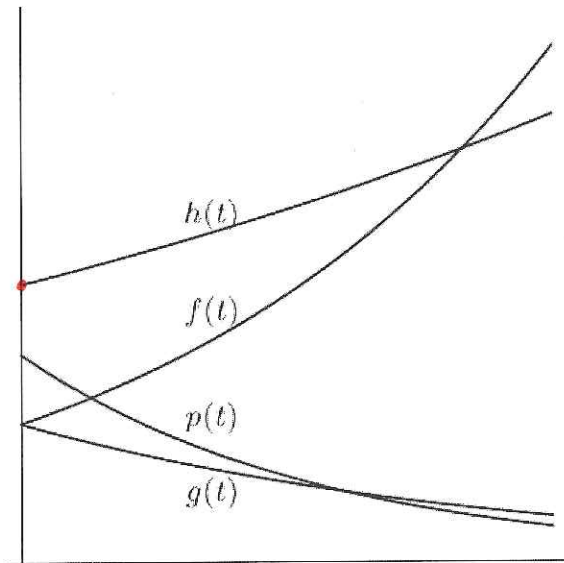
$$\frac{13,000}{5,000} = e^{.027t}$$

$$\ln\left(\frac{13}{5}\right) = \ln e^{.027t}$$

$$\frac{\ln\left(\frac{13}{5}\right)}{.027} = \frac{.027t}{.027}$$

$$35.39 \text{ years} = t$$

38. In the following figure, the functions f , g , h , and p can all be written in the form $y = ab^t$. Which one has the largest value for a ?



39. Taylor has \$10,000 which she would like to invest. She can either invest in a CD earning 3.1% annual interest compounded quarterly, or she can deposit the money in a savings account earning 2.9% annual interest compounded monthly. If she chooses the investment with the maximum return, how much will she have at the end of 5 years?

$$10,000 \left(1 + \frac{0.031}{4}\right)^{5 \cdot 4} \qquad 10,000 \left(1 + \frac{0.029}{12}\right)^{5 \cdot 12}$$

$$\boxed{\$11,649.60} \qquad 11,558.37$$

40. An ant population grows at a continuous growth rate of 11.2%. If the population starts with 24,000 ants, how many ants are there after 6 months? Round your answer to the nearest ant.

$$24,000 e^{-0.112(0.5)}$$

$$25,1382.34$$

$$\boxed{25,382 \text{ ants}}$$

41. Rewriting the statement $\ln\left(\frac{1}{9}\right) = -2.197$ using exponents gives

(A) $e^{-2.197} = \frac{1}{9}$

B) $e^{-2.197} = 9$

C) $e^9 = \frac{1}{-2.197}$

D) $e^9 = -2.197$

$$\log_e\left(\frac{1}{9}\right) = -2.197$$

$$e^{-2.197} = \frac{1}{9}$$

42. Solve $11e^{4t} - 22 = 0$ algebraically for t . Give your answer to 4 decimal places.

$$\begin{aligned} 11e^{4t} &= 22 \\ e^{4t} &= 2 \\ \ln e^{4t} &= \ln 2 \\ 4t &= \frac{\ln 2}{4} \\ t &= .1733 \end{aligned}$$

43. The half-life of a substance is 40 hours. If there are initially 100 grams of the substance, how many grams are remaining after 51 hours? Round your answer to 3 decimal places.

$$\begin{aligned} 50 &= 100e^{r \cdot 40} \\ \frac{1}{2} &= e^{40r} \\ \ln\left(\frac{1}{2}\right) &= \ln e^{40r} \\ \frac{\ln\left(\frac{1}{2}\right)}{40} &= \frac{40r}{40} \\ -.017329 &= r \end{aligned}$$

$$100e^{-.0173286795(51)}$$

$$\boxed{41.323 \text{ grams}}$$

44. What is the doubling time of a population growing by 12% per year? Round your answer to the nearest hundredth of a year.

$$\begin{aligned} 2A &= A(1.12)^t \\ 2 &= 1.12^t \\ \log 2 &= \log 1.12^t \\ \frac{\log 2}{\log 1.12} &= \frac{t \log 1.12}{\log 1.12} \end{aligned}$$

NOT CONTINUOUS!

$$\boxed{t = 6.12 \text{ years}}$$

45. Sound A is 33 dB. Sound B is 60 dB. How many times more intense is Sound B than Sound A? Use $\text{dB} = 10 \log(I/I_0)$ where I is the intensity of the sound and $I_0 = 10^{-16}$.

$$\begin{aligned} 33 &= 10 \log\left(\frac{I}{10^{-16}}\right) & 60 &= 10 \log\left(\frac{I}{10^{-16}}\right) \\ 3.3 &= \log_{10}\left(\frac{I}{10^{-16}}\right) & 6 &= \log_{10}\left(\frac{I}{10^{-16}}\right) \\ 10^{3.3} &= \frac{I}{10^{-16}} & 10^6 &= \frac{I}{10^{-16}} \\ 10^{3.3-16} &= I & 10^{-16} \cdot 10^6 &= I \\ 10^{-12.7} &= I & 10^{-10} &= I \end{aligned}$$

$$\frac{10^{-10}}{10^{-12.7}} = \boxed{501}$$

46. A cup of coffee is initially at $180^\circ F$, which is $105^\circ F$ above room temperature. The difference between the coffee's temperature and the room's temperature decreases at the hourly rate of 85%. Which of the following formulas gives $T(t)$, the coffee's temperature after t hours have elapsed?

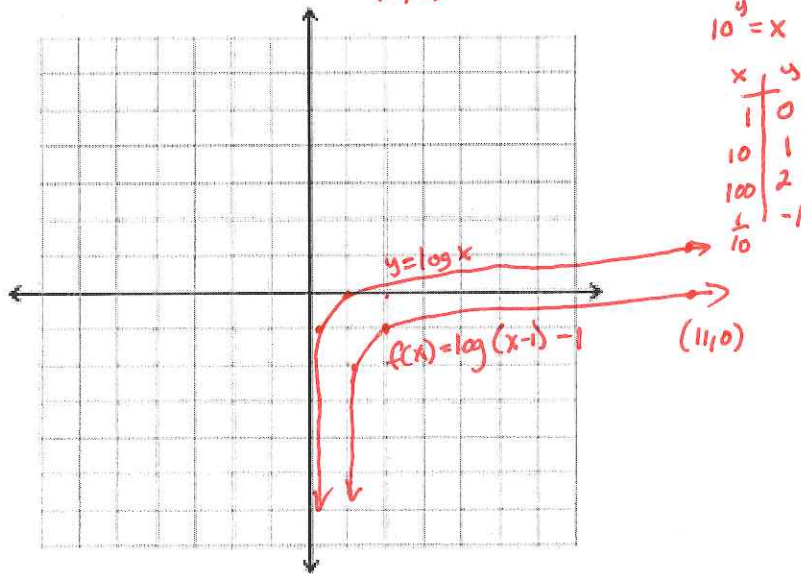
- A) $T(t) = 180 + 75(0.15)^t$
 B) $T(t) = 105 + 75(0.15)^t$
 C) $T(t) = 180 + 105(0.15)^t$
 D) $T(t) = 75 + 105(0.15)^t$

47. Let $f(x) = \log(x-1) - 1$.

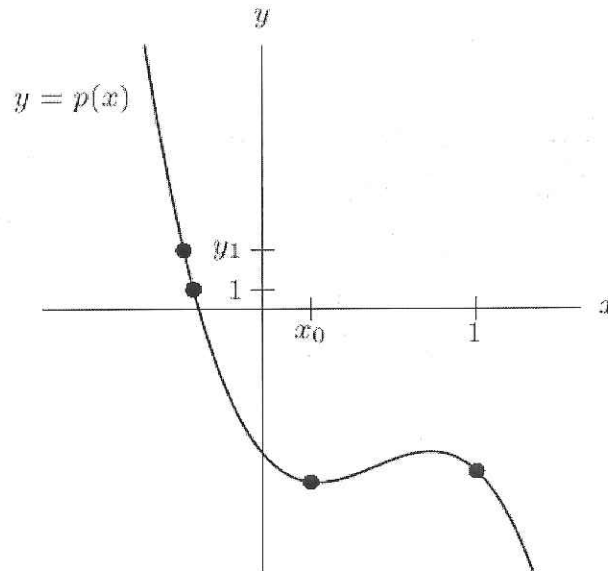
A) Graph f .

B) What are the asymptotes? $x=1$

C) What are the intercepts? $(11, 0)$



48. Let $y = p(x)$ be defined by the following graph, and let $y_0 = p(x_0)$ and $y_1 = p(x_1)$.



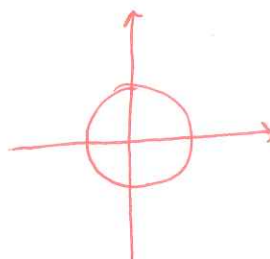
Which of the following two values is greater?

A) $p(x_0) + 1$

B) $p(x_0)$

49. A bowling alley charges \$2.80 for shoes plus \$2.25 per game bowled. Let $C(g)$ be the total cost for bowling g games (including shoe rental). Now suppose the bowling alley decides to increase the cost for shoes by \$1.20 and include the first game for free. What is the formula for the new total cost, $N(g)$, of bowling g games as a transformation of $C(g)$?
- A) $N(g) = C(g - 2.25) + 4.00$
 B) $N(g) = C(g - 1) + 1.20$
 C) $N(g) = C(g - 1) + 4.00$
 D) $N(g) = C(g + 1.25) + 1.20$

50. An odd function is decreasing and concave down in the first quadrant. How does the function behave in the third quadrant?
- A) It is increasing and concave up
 B) It is decreasing and concave down
 C) It is decreasing and concave up
 D) It is increasing and concave down



51. The function $f(x)$ has odd symmetry and the function $g(x)$ has even symmetry. Is the function $h(x) = 4g(x+1)$ odd, even, or neither?

Symmetrical across y-axis moved left 1 will not be symmetric about y-axis anymore.

NEITHER

52. The graph of $g(x)$ is the graph of $f(x)$ after it has been vertically stretched or shrunk. The point $(5, 12)$ lies on the graph of $f(x)$. The corresponding point on the graph of $g(x)$ is $(5, 24)$. What is a possible formula for $g(x)$ in terms of $f(x)$?

Vertical stretch SF 2

$$g(x) = 2f(x)$$

53. If $f(x)$ is an even function, determine whether $g(x) = 9f(x - 4)$ is odd, even, or neither. State "cannot tell" if there is not enough information to determine.

NEITHER - NO LONGER SYMMETRIC WITH Y AFTER HORIZONTAL SHIFT

54. The graph of $h(x)$ contains the point $(3, 3)$. What is the corresponding point on the graph of $y = h(4x)$?

Horizontal Compression SF $\frac{1}{4}$

$$\left(\frac{3}{4}, 3\right)$$

55. The point $(2, -8)$ lies on the graph of f . If the graph of f is compressed vertically by a factor of $\frac{1}{5}$ and stretched horizontally by a factor of 11, what point must lie on the transformed graph?

$$(2, -8)$$

$$\left(2, -\frac{8}{5}\right)$$

$$\left(22, -\frac{8}{5}\right)$$