Chapter 7: Exponential Functions

Section 7.1: Graphs of Exponential Functions

#1-39: Plot 5 points and sketch a graph of the function, state the domain and range of the function. You may round to 1 decimal, or use fractions when appropriate.

1) $f(x) = 3^x$

2) $g(x) = 2^x$

3) $f(x) = 4^x$

4) $g(x) = 5^x$

5) $g(x) = 2^{x-3}$

6) $f(x) = 4^{x-2}$

7) $h(x) = 2^{x-5}$

8) $f(x) = 3^{x-1}$

9) $m(x) = 3^{x-4}$

10) $g(x) = 3^{x+2}$

11) $g(x) = 2^{x+3}$

12) $f(x) = 4^{x+2}$

13) $h(x) = 2^{x+5}$

14) $f(x) = 3^{x+1}$

15) $m(x) = 3^{x+4}$

16) $f(x) = \left(\frac{1}{2}\right)^x$

17) $g(x) = \left(\frac{1}{3}\right)^x$

18) $f(x) = \left(\frac{1}{4}\right)^x$

19) $f(x) = \left(\frac{1}{5}\right)^x$

20) $g(x) = \left(\frac{1}{2}\right)^{x-1}$

21) $f(x) = \left(\frac{1}{2}\right)^{x-3}$

22) $f(x) = \left(\frac{1}{3}\right)^{x-1}$

23) $g(x) = \left(\frac{1}{3}\right)^{x-5}$

24) $f(x) = \left(\frac{1}{2}\right)^{x+3}$

25) $f(x) = \left(\frac{1}{3}\right)^{x+1}$

26) $g(x) = \left(\frac{1}{3}\right)^{x+5}$

27) $f(x) = \left(\frac{1}{4}\right)^{x+2}$

28) $f(x) = 2^x + 3$

29) $f(x) = 3^x + 4$

30) $f(x) = 4^x - 2$

31) $f(x) = 2^x - 1$

32) $f(x) = 2^{x+2} + 1$

33) $f(x) = 3^{x+4} + 2$

34) $f(x) = 5^{x-3} - 2$

35) $f(x) = 2^{x-4} - 3$

36) $f(x) = 6^{x+3} - 4$

37) $f(x) = 2^{x-7} + 5$

38) $f(x) = 3^{x-2} + 4$

39) $f(x) = 2^{x-6} + 1$

Chapter 7: Exponential Functions

Section 7.2: Exponential Equations

#1 - 42: Solve the exponential equation by writing each side of the equation with the same base then equating the exponents.

1) $2^x = 16$

2) $3^x = 27$

3) $2^x = 32$

4) $4^x = 16$

5) $3^x = 27$

6) $2^{x+1} = 32$

7) $2^{4-x} = 64$

8) $3^{5-x} = 243$

9) $2^{6-x} = 16$

10) $27^x = 3$

11) $16^x = 4$

12) $49^x = 7$

13) $64^x = 2$

14) $125^{x+2} = 625$

15) $25^{x-3} = 5$

16) $\left(\frac{1}{2}\right)^x = 8$

17) $\left(\frac{1}{2}\right)^x = 16$

18) $\left(\frac{1}{3}\right)^x = 27$

19) $\left(\frac{1}{4}\right)^x = 256$

20) $\left(\frac{1}{5}\right)^x = 125$

21) $\left(\frac{1}{3}\right)^x = 81$

22) $\left(\frac{1}{2}\right)^{x-3} = 32$

23) $\left(\frac{1}{2}\right)^{x+1} = 8$

24) $\left(\frac{1}{3}\right)^{x-4} = 9$

25) $\left(\frac{1}{4}\right)^{x-7} = 256$

26) $\left(\frac{1}{5}\right)^{2x-1} = 125$

27) $\left(\frac{1}{3}\right)^{4x+1} = 81$

28) $2^x = 16^{x-4}$

29) $3^x = 9^{x+1}$

30) $5^x = 25^{x+6}$

31) $2^{x+4} = 16^{2x-3}$

32) $3^{x+1} = 27^{5x+4}$

33) $5^{x-3} = 25^{4x-7}$

34) $7^{x-1} = 49^{x-4}$

35) $27^x = 9^{x+1}$

36) $125^x = 25^{x+6}$

37) $64^{x+4} = 16^{2x-3}$

38) $81^{x+1} = 3^{5x+4}$

39) $625^{x-3} = 25^{4x-7}$

40) $9^{x-1} = 27^{5x}$

41) $16^x = 32^{7x}$

42) $625^x = 25^{x+6}$

Chapter 7: Exponential Functions

Section 7.3: Applications of Exponential Functions

1) The value v(t), in dollars of a new Toyota Corolla in dollars that is t years old is modeled by the function:

$v(t) = 21{,}000(0.90)^t$

Find the value of the Corolla in 4 years. (round to the nearest dollar)

2) The value v(t), in dollars of a new Ford Raptor in dollars that is t years old is modeled by the function:

$v(t) = 68{,}000(0.93)^t$

Find the value of the Raptor in 6 years. (round to the nearest dollar)

3) The number of computers infected by the spread of a virus through email can be described by the exponential function $c(t)=4(1.02)^t$, where t is the number of minutes since the first infected e-mail was opened. Approximate the number of computers that will be infected after 6 hours (240 minutes) (round to the nearest whole number).

4) A colony of 2 million bacteria is growing in a culture medium. The population P of bacteria after t hours is given by the function $P(t)=2{,}000{,}000(2.3)^t$, Find the population of the culture in 12 hours. (round to the nearest million)

5) The charge remaining in a battery decreases as the battery discharges. The charge C (in coulombs) after t days is given by the formula $C(t)= 0.0003(0.7)^t$. Find the charge after 5 days. (round your answer to 5 decimal places)

6) Five hundred grams of a radioactive material decays according to the formula: $A = 500\left(\frac{2}{3}\right)^t$, where t is measured in years. Find the amount present in 10 years. (Round to the nearest one-tenth of a gram.)

#7-10: Use the exponential growth function: $P(t) = P_0e^{rt}$ (where P_0 is the initial population, r is the growth rate as a decimal, and t is time) to answer the following questions.

7) 100 people are in a room where a rumor is told. The number of people that have heard the rumor is growing at a rate of 25% per day. How many people will have heard the rumor after 5 days? (round to the nearest integer)

8) 1,000 computers have been infected with a virus. The number of computers infected is growing at a rate of 3% per day. How many computers will be infected after 10 days? (round to the nearest integer)

9) The number of daily visitors to a new website is currently 10 million people per day. The number is growing at a rate of 0.5% per day. How many people will visit the website in 30 days? (round to the nearest integer)

Chapter 7: Exponential Functions

Section 7.3: Applications of Exponential Functions

10) The number of daily visitors to Amazon is currently 100 million people per day. The number is growing at a rate of 0.25% per day. How many people will visit Amazon in 30 days? (round to the nearest integer)

#11-14: Use the exponential decay function: $P(t) = P_0e^{-rt}$ (where P_0 is the initial population, r is the decay rate as a decimal, and t is time) to answer the following questions.

11) The number of people infected with the flu is gradually decreasing. There are currently 100 thousand people in the USA with the flu. The number of people with the flu is decreasing by 2% per day. How many people will have the flu in 30 days? (round to the nearest integer)

12) The number of people who smoke in the USA is gradually decreasing. There are currently 20 million people that smoke in the USA. This number is decreasing by 3% per year. How many people will smoke in 10 years? (round to the nearest integer)

13) The population of Belgium is currently 11 million. The population is decreasing by 1% per year. Estimate the population of Belgium in 10 years. (round to the nearest integer)

14) The population of a certain country is currently 100 million. The population is decreasing by 2% per year. Estimate the population in 25 years. (round to the nearest integer)

#15-20: Use the compound interest formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$ to answer the following.

15) An initial deposit of $1,000 earns 4% interest compounded twice per year. How much will be in the account after 5 years?

16) An initial deposit of $1,000 earns 3% interest compounded twice per year. How much will be in the account after 10 years?

17) An initial deposit of $10,000 earns 6% interest compounded quarterly. How much will be in the account after 7 years?

18) An initial deposit of $20,000 earns 3% interest compounded quarterly. How much will be in the account after 17 years?

19) An initial deposit of $100,000 earns 4% interest compounded annually. How much will be in the account after 5 years?

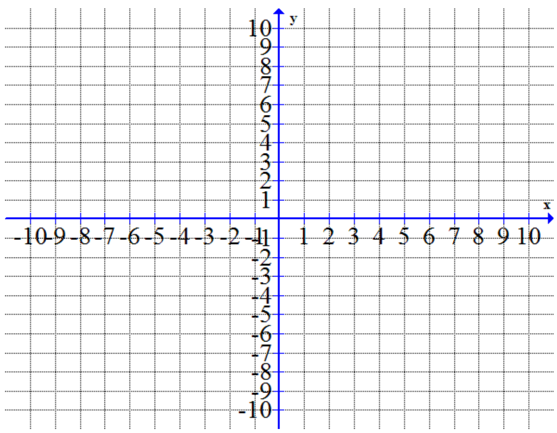
20) An initial deposit of $200,000 earns 7% interest compounded semi-annually. How much will be in the account after 15 years?

Chapter 7: Exponential Functions

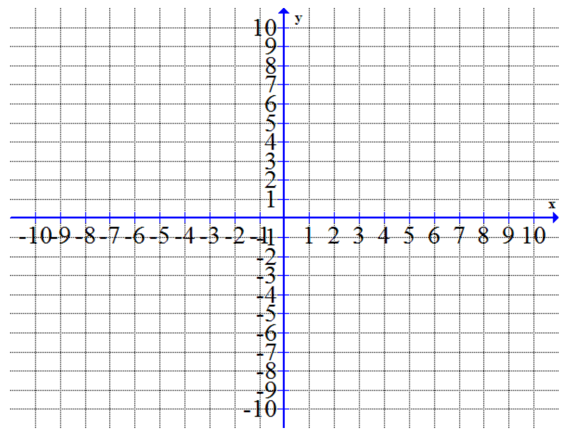
MAT 120 Chapter 7 Practice test

#1-3: Plot 5 points and sketch a graph of the function, state the domain and range of the function. You may round to 1 decimal, or use fractions when appropriate.

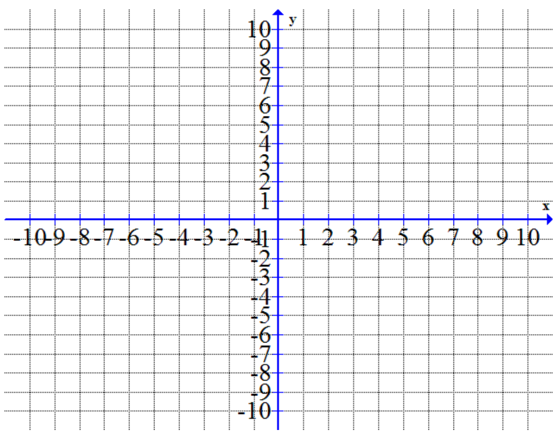
1) $m(x) = 2^{x-1}$



2) $f(x) = 3^{x} + 2$



3) $g(x) = \left(\frac{1}{3}\right)^{x-2}$



#4 - 11: Solve the exponential equation by writing each side of the equation with the same base then equating the exponents.

4) $3^{x} = 81$

5) $2^{x+4} = 32$

Chapter 7: Exponential Functions

6) $\left(\frac{1}{3}\right)^{x} = 27$

7) $\left(\frac{1}{2}\right)^{3x+5} = 32$ (fraction answer)

8) $25^{x-2} = 5$ (fraction answer)

9) $25^{x-3} = 125^{4x+3}$ (fraction answer)

10) $4^{x+2} = 8^{x}$

11) $49^{x+3} = 7$ (fraction answer)

12) Use the exponential growth function: $P(t) = P_0e^{rt}$ (where P_0 is the initial population, r is the growth rate as a decimal, and t is time) to answer the following questions.

The population of the Arizona is currently 7 million and is growing at a rate of .75% per year. Estimate the population of Arizona in 20 years. Round to 2 decimals.

13) Use the compound interest formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$ to answer the following.

An initial deposit of $10,000 earns 3% interest compounded quarterly. How much will be in the account after 5 years?

14) Use the exponential decay function: $P(t) = P_0e^{-rt}$ (where P_0 is the initial population, r is the decay rate as a decimal, and t is time) to answer the following questions.

Chapter 7: Exponential Functions

The population of the Japan is currently 125 million and is shrinking at a rate of .25% per year. Estimate the population of the Japan in 10 years. Round to 2 decimals.