

Practice Questions for MA 15300 Test 2 (Sections 4.1-4.5 and 5.1-5.3)



TIP: Open the bookmark panel by selecting the Bookmarks icon  along the side margin to easier navigation.
The actual test will be shorter.

1) Answer the following for $f(x)$ and $g(x)$. Give only **exact** numerical answers

a) $f(x) = 80(1.139)^x$

The initial value is _____. The growth factor is _____.

The function grows by a percent rate of _____%.

b) $g(x) = 500(0.25)^x$

The initial value is _____. The growth factor is _____.

The function decays by a percent rate of _____%.

2) A typical cup of coffee contains 75 milligrams of caffeine.

Each hour 81% of the amount of caffeine in the body is metabolized and eliminated.

Suppose a person drinks a cup of coffee. Suppose that after it the person does not consume caffeine, and they had no caffeine in their body before.

a) Write a formula $A(t)$ for the amount of caffeine in the body in mg of caffeine as a function of t , the number of hours since the coffee was consumed.

b) How much caffeine is in the body after 2 hours? Report to the nearest 0.1 mg.

c) After how many hours is there less than 1 milligram left in the body?

Report your answer **to the nearest 0.1 hr**. SHOW WORK.

3) The balance B of an account climbs exponentially according to the following table.

t , years	B , dollars
2	1024
7	3125

a) Write a formula for the exponential function. SHOW WORK

b) Find the amount in the account at year $t = 4$.

c) How many years does it take until the balance first exceeds \$5929? Report your answer **to the nearest to the nearest 0.01 months**. SHOW WORK

d) What was the initial amount of the investment? Report to nearest penny.

e) What **annual interest rate** does the account pay?

4) An amount of \$4000 increases to \$4600 in one month.

a) By what percent does the amount increase? **Do not round off**. SHOW WORK.

b) Assume the trend continues the next month. By what **total** percent does the amount of \$4000 increase over the length of the whole 2 month period? **Do not round off**. SHOW WORK.

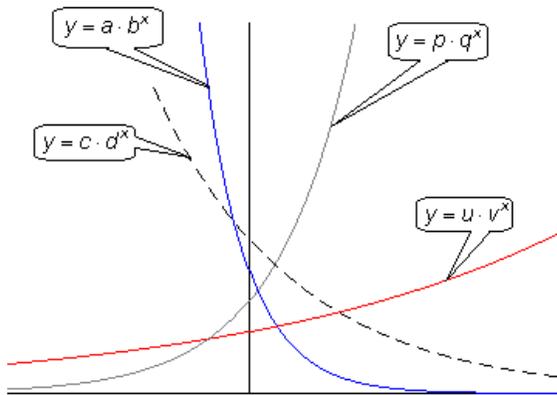
5) Sales of computers increase by 15% **per month** over a 4-month period.

Let $g(t)$ be the number of computers sold, where t is in months.

a) If 1000 computers were sold at month $t = 0$, determine the number sold in month $t = 1$ and month $t = 4$. Round each to **whole number** of values.

b) By what **total** percent did sales of computers increase over the length of the whole 4 month period? Round the answer correct to **one** decimal place.

6) Consider the exponential functions whose graph is shown.



- Which of a , c , p , and u is the **largest** ?
- Which of a , c , p , and u is the **smallest** ?
- Which of b , d , q , and v is the **largest** ?
- Which of b , d , q , and v is the **smallest** ?

Useful Formulas: $A = P \left(1 + \frac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$.

For 7 and 8 please show work. The correct answer with no calculations or work still earns no points.

- Suppose you invest \$600 at an annual rate of 6.25%. Report your answer rounded correct to the nearest \$0.01
 - How much will you have in 21 years if it is compounded **monthly**?
 - How much will you have in 21 years if it is compounded **continuously**?
- You need \$4734 thirteen years from now. What is the minimum amount of money you need to deposit into a bank account that pays 6.25% annual interest, compounded **continuously**? Report your answer rounded correct to the nearest \$0.01.
- Suppose $Q = 5000e^{0.0742t}$ gives the balance in an account, where t is in years.
 - Describe how the interest is compounded by completing the blanks.
The account pays _____ % compounded continuously.
 - Find the percent annual growth rate. Report to the nearest **0.1** %.
 - Approximate the amount of time t it will take for the account to first exceed \$6200.
Write an equation and solve algebraically using logarithms. Report to the nearest **0.1** years.
 - Approximate the amount of time t it will take for the account to triple.
Write an equation and solve algebraically using logarithms. Report to the nearest **0.1** years.
- Find the logarithm
 - $\ln e^{5x-1}$
 - $\log 10^{7x}$
 - $\log_5 \sqrt{5}$
 - $\log_{\sqrt{5}} \sqrt{5}$
 - $\ln \sqrt{e^{7x}}$
 - $\ln \frac{1}{\sqrt{e^{7x}}}$

g) $\log_5 \sqrt[7]{5^x}$

h) $\log_5 \frac{1}{25}$

i) $\log 100^{11x}$

11) Simplify, and report an exact answer.

a) $e^{\ln \sqrt{5x}}$

b) $100^{2 \log x^5}$

12) Simplify the expression $\log \frac{x^{20}}{y^2}$. Select one of A through K.

A. $\left(\frac{x}{y}\right)^{18}$

B. $\frac{\log x^{20}}{\log y^2}$

C. $18 \log(x - y)$

D. $20x - 2y$

E. $\frac{10x}{y}$

F. $\left(\frac{x}{y}\right)^{20}$

G. $\frac{18x}{y}$

H. $20 \log x - 2 \log y$

I. $10 \log(x - y)$

J. $18 \log(10x - y)$

K. None of these

13) Solve the equations.

Report both an exact solution (involving a logarithm) and an approximate solution to 3 decimal places.

a) $3e^{5x-10} = 60$

b) $7 \cdot 10^x + 10 = 70$

c) $26(0.5)^{x/7} + 40 = 48$

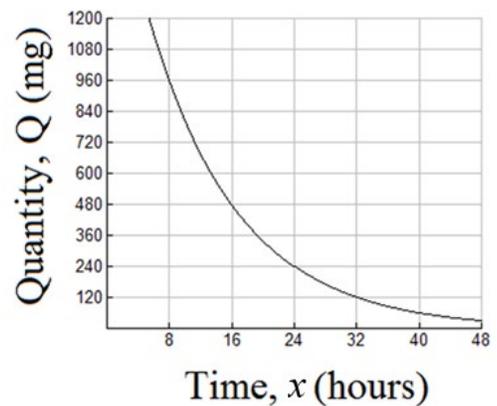
14) Solve the equations. Report both an exact solution and an approximate solution to 3 decimal places.

a) $5 \ln(3x) = 20$

b) $5 \log x + 7 = 10$

15) A function $Q = f(x)$ gives the amount, in mg of drug in a patient's body x hours after they take a single dose. The function Q decays exponentially.

x , hours	Q , mg
0	
8	960
16	480
24	240
32	120



To see a graph of Q as a function of x , open [this Desmos graph](#).

a) Complete the entry in the first row in the table shown above, shaded.

b) Assuming the pattern holds, complete the last row of the table shown below, shaded.

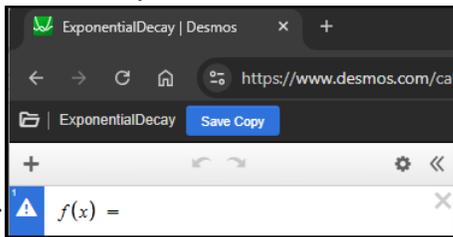
x , hours	Q , mg
0	initial dose
8	960
16	480
24	240
32	120



c) Report the half-life, in hours.

d) Find a formula for this function.

You can check you have the correct formula by entering the function in Desmos for $f(x)$



e) What was the original amount of medication taken? _____ mg

f) Complete, reporting each to the nearest 0.1 percent.

Every hour the patient loses _____ % and keeps _____ % of the drug.

g) Find, to the nearest 0.01 hour, the time it takes for the amount of drug to first fall below 1000 mg.

Show work. $t \approx$ _____ hours

16) The relationship of pH to the hydrogen ion concentration C is $\text{pH} = -\log C$.

If the pH is 2.15 what is the hydrogen ion concentration? Report to three decimal places. Select one.

A. 141.254 B. 0.332 C. 0.007 D. -141.254 E. -0.332 F. -0.007

17) A small town of 2000 people increases to 3340 people in five years, growing *exponentially*.

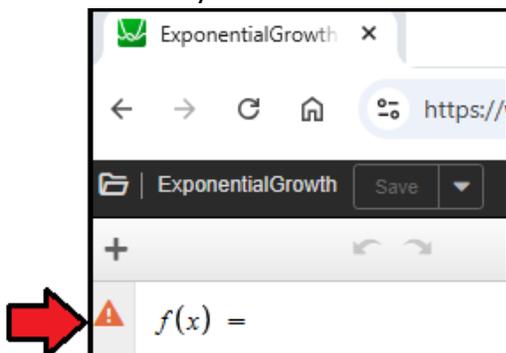
a) By what total percent did the population increase in this five year time span?

b) By what percent did the population grow each year? Round the answer correct to **one** decimal place.

c) Write a formula for the population $P = f(x)$ of the town in year x .

To see a graph of P as a function of x , open [this Desmos graph](#).

You can check you have the correct formula by entering the function in Desmos for $f(x)$



- 18) Sales of an item increase by 50% every 9 years.

Assume sales $f(t)$ continue to grow exponentially, where t is in years.

t	$f(t)$
0	100
9	
18	

- a) If 100 items were sold at year $t = 0$, complete the shaded cells of the table to determine the number sold in year $t = 9$ and year $t = 18$. Report **whole number** of values.
- b) At what effective percent rate does it increase **per year**? Round to the nearest **0.1** percent.
- c) Write a formula for $f(t)$.
- 19) Sales of an item decrease by 98% every 6 years.
- Assume sales $f(t)$ continue to decay exponentially, where t is in years.

t	$f(t)$
0	100,000
6	
12	

- a) If 100,000 items were sold at year $t = 0$, complete the shaded cells of the table to determine the number sold in year $t = 6$ and year $t = 12$. Report **whole number** of values.
- b) At what effective percent rate does it decrease **per year**? Round to the nearest **0.1** percent.
- c) Write a formula for $f(t)$.
- 20) If a function decays according to the formula $Q = 400(0.5)^{t/53}$, where t is in minutes.

- a) Report the half-life, in minutes.
- b) By what percent does it decay each minute?

- 21) A function increases at a rate of 17.76% per day.

- a) Write a formula for the amount Q at day t , where Q_0 is the initial amount. Do not round any values.

$$Q = Q_0 \cdot (\underline{\hspace{2cm}})^t$$

- b) Report the doubling time.
- i) Solve analytically and report your **exact** answer involving natural or common logarithms.
- ii) Report an **approximate** answer of the doubling time accurate to 0.01 days.
- c) Report the tripling time.
- i) Solve analytically and report your **exact** answer involving natural or common logarithms.
- ii) Report an **approximate** answer of the tripling time accurate to 0.01 days.

For a worked out key, see your Brightspace course.

Would you like more practice over specific topics?

See the Flash Cards for Sections 4.1-4.5 and 5.1-5.3 as well as the Just for Practice sets.

Find these in your Brightspace course in the module **Flash Cards and Just for Practice Sets**.