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## IAG 1 Skinny

## Midterm Exam

## Review Packet

Answers to Some Commonly Asked Questions:

- This exam is over the entire semester.
- You get a $3 \times 5$ notecard, front and back, to use on the exam. This card will be provided by Ms. H and turned in with the midterm. You will not be provided with any equations on the actual test.
- Roughly $75 \%$ of the questions on the final come from old tests, quizzes, and review packets. The numbers in the problems will be changed.
- You have an hour and a half to take the exam.
- This is NOT a multiple choice exam-the format of the exam is the same as all the other tests you have taken in IAG 2 this year.
- How to study-PRACTICE, over and over and over! Start by re-reading all the notes (found under the "Note" tab in the binder), work on the Midterm Exam Review Packet you are given, identify your areas of weakness, then find the quizzes and tests that correspond to these topics. Re-do the problems on a separate sheet of paper and check your answer against the original answer. Do NOT simply "look over" a problem-this is a waste of your time and is not an effective way to study. If you do not have the correct answer written down on the original paper, see Ms. H.
- Good luck!


## Unit 1 -Functions

1. State the theoretical domain and range of each of the functions below.
a) $f(x)=4 x+6$
b) $h(x)=\frac{7}{x}$
c) $g(x)=\sqrt{5 x}$
d) $f(x)=|x|$
To graph this, go to $\mathrm{y}=$, Math, NUM, 1: abs(, press enter and then type in the x !
2. The following graph shows how the income from an amusement park bungee jump $I(p)$ is related to ticket price p.
a) Is the function increasing, decreasing or both?
b) What does the maximum point tell you about the amusement park bungee jump?

c) Does this function have any $x$-intercept(s)? If so estimate the point(s).
d) Does this function have a y-intercept? If so estimate the point.
e) Is the graph of this function symmetrical? If so, draw in a dashed line where the line of symmetry would be located-please do so with ink or a highlighter
f) What is the practical domain of this function?
g) What is the practical range of this function?
3. Solve the following inequality algebraically:
4. Solve for $x$ in the following equation algebraically: $\quad 6(x-4)=-4 x+3(x+6)-14$
5. The following graph represents Karen's marathon.

a) What are the units for the average rate of change?
b) What is the rate of change for interval A? (Don't forget to include the units!)
c) Which interval has a greater rate of change, interval B or interval D? Explain how you can tell just by looking at the graph.
d) What is the average rate of change for interval C? Explain what you think may have happened during this interval.

## Unit 2 (Part I) - Linear Functions

6. Andy wants to make some money over the summer mowing his parent's lawn. His parents said that they would use the rule $A=2+5 \mathrm{~m}$ to determine the amount of money he will earn $A$ based on the number of times he mows the lawn $m$.

Explain the meaning of the 2 and the 5 in this equation in terms of the amount of money Andy will make mowing lawns.
7. The table below gives the median price of a home starting with the year 1970. Below is a scatterplot of the data with a linear model.

| Year <br> (since <br> 1970) | Median Price of a <br> House in U.S. (in <br> thousands) |
| :---: | :---: |
| 0 | 27 |
| 5 | 48.7 |
| 10 | 64.6 |
| 15 | 90.4 |
| 20 | 113.5 |
| 25 | 137.2 |
| 30 | 161.5 |


a. Using the scatterplot, estimate in what year the median price of a house will be $\$ 80,000$. Show your work on the graph.
b. The linear model above passes through the points $(8,63)$ and $(24,133)$. Find the equation of the linear model. You will need to find both the slope and $y$-intercept of this line. Show your work below.
c. Identify the slope and the y-intercept of the regression equation. Explain what they mean in the context of the problem.

Slope $=$ $\qquad$

## Explanation:

$\qquad$

## Explanation:

8. The graph below displays how the cost of a 12 -ounce soft drink changes as year changes.
a. Find the slope of the line.

b. Write a Now-Next equation that would model the line. Don't forget a 'starting at' value!

Next $=$ $\qquad$ Starting at $\qquad$
c. Let $x=$ number of years ago and $y=$ cost of soft drink. Write an equation relating $x$ and $y$.

## Unit 2 (Part II) - Exponential Functions

9. Radioactive materials have many important uses in the modern world, from fuel for power plants to medical x-rays. Radioactive materials also can be very dangerous - for example it can cause cancer. The radioactive chemical strontium-90 is produced in many nuclear reactions. Extreme care must be taken in transportation and disposal of this substance. It decays very slowly - if any amount is stored at the beginning of a year, $98 \%$ of that amount will still be present at the end of the year.
a. If 225 grams of strontium-90 are released due to an accident, how much of that substance will still be around after 1 year? After 3 years?
b. Write a NEXT-NOW equation that can be used to calculate the amount of strontium-90 remaining after any number of years.
$\qquad$ Starting at $\qquad$
c. Write an equation in the form $y=a \cdot b^{x}$ that can be used to calculate the amount of strontium-90 remaining after $x$ number of years.
e. How long is the half-life of strontium-90? That is, how long until half of the original amount remains? Explain how you found your answer.
d. How long will it take for there to be less than 2 grams of strontium-90?
10. Suppose that your grandparents starting a savings account for you when you were born. Your grandparents put $\$ 5000$ into a savings account that pays $7 \%$ interest annually.
a. Write an equation in the form $y=a \cdot b^{x}$ that models this situation.
b. Use your equation to fill in the below table.

| Yrs since <br> birth | 0 | 1 | 2 | 7 | 12 | 16 | 20 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Value of <br> account | $\$ 5,000$ |  |  |  |  |  |  |

11. Algebraically, find an equation for an exponential function that passes through $(2,5)$ and $(3,20)$.
12. Simplify the following using the Laws of Exponents. Use positive exponents in your final answer.
a) $Z^{0}$
b) $\left(\frac{a}{b}\right)^{6}$
c) $7 x^{-4}$
d) $\left(2 x^{2}\right)^{3}$
e) $\left(x^{5} y^{2}\right)\left(x^{3} y^{4}\right)$
f) $\left(\frac{x^{6} y^{5}}{x^{5} y^{3}}\right)^{3}$
13. The following table gives the number of AIDS cases reported in the Los Angeles area for the years 1983 through 1988.

| Years since 1983 | 0 | 1 | 2 | 3 | 4 | 5 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Number of Aids Cases <br> Reported | 270 | 450 | 640 | 900 | 1300 | 1800 |

a) Use your calculator to find a regression equation for a linear model and for an exponential model. If necessary, round to three decimal places.

Linear Model: $\qquad$

Exponential Model: $\qquad$
b) For your exponential model, explain what the growth factor means in the context of the problem.
c) Make a scatterplot of the data on your calculator. Based on the scatterplot and the data table, which equation do you think best models the data [linear or exponential]?

I think it is $a(n)$ $\qquad$ model

I can tell using the graph because. . .

I can tell using the table because. . .
d) Using the model you choose in part c , when did the predicted number of Aids cases reach 1 million?

## Unit 3 - Sequences and Population Change

14. Suppose that the current population of alligators in a particular region is 1,300 . As a result of births and natural deaths, the population increases by $10 \%$ each year. Suppose that hunters are allowed to capture a total of 150 alligators each September.
a. Write the NOW-NEXT formula to model this situation.

Next $=$ $\qquad$ starting at $\qquad$
b. How many alligators will there be 5 years from now?

| Year | Alligator Population |
| :--- | :--- |
| o | 1,300 |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

15. In 2007, Nevada was the state with the fastest growing population. It had a population of approximately 2.57 million people and an annual growth rate of $2.9 \%$.
a. Use the information to estimate the population of Nevada in 2008.
b. Consider the sequence of annual population estimates for Nevada. Is the sequence arithmetic, geometric, or neither?
c. Determine a recursive and a function formula for the sequence of population estimates.

Recursive Formula:

$$
a_{n}=
$$

$\qquad$ with $\mathrm{a}_{\mathrm{o}}=$ $\qquad$
Function Formula:
$\mathrm{a}_{\mathrm{n}}=$ $\qquad$
d. Predict the population of Nevada in 2027.
16. The music department at Wilson High School operates a soft drink machine near the auditorium. The distributor comes monthly and empties the money from the machine. The music department earns $\$ 60$ plus $\$ 4$ per case sold.
a. The amount the music department earns each month depends on the numbers of cases sold. Fill in the table below.

| Number of <br> Cases Sold | 0 | 1 | 2 | 3 | 4 | 5 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Amount <br> Earned | 60 |  |  |  |  |  |

b. Is the sequence of monthly earnings arithmetic, geometric, or neither? Explain.
c. Determine the recursive and function formulas for the sequence of monthly earnings described above.

Recursive Formula: $\mathrm{a}_{\mathrm{n}}=$ $\qquad$ with $\mathrm{a}_{\mathrm{o}}=$ $\qquad$

Function Formula: $\mathrm{a}_{\mathrm{n}}=$ $\qquad$
d. How much will the music department earn in a month if 25 cases of soft drinks are sold? Explain or show your work.
e. During April, the music department made $\$ 208$. How many cases of drinks were sold?
17. At the beginning of 2009, Erin borrowed $\$ 12,000$ from a special student loan fund to help pay her way through college. The interest on the loan is $8 \%$ compounded annually.
a. Complete the table below, showing the amount to the nearest dollar Erin owes at the beginning of each year, assuming that she does not pay anything on the loan.

| Year | Amount Owed (in dollars) |
| :--- | :--- |
| 2009 |  |
| 2010 |  |
| 2011 |  |
| 2012 |  |

b. Consider the sequence of increasing amounts owed. Is this sequence arithmetic,, geometric, or neither? Explain how you can tell from the pattern in the table.
c. Write the NOW-NEXT, recursive, and function formula for the sequence of amounts that Erin owes.

$$
\text { Next }=\ldots \text { starting at }
$$

Recursive: $\quad a_{n}=$ $\qquad$ with $\mathrm{a}_{\mathrm{o}}=$ $\qquad$
Function: $\quad a_{n}=$ $\qquad$ with $\mathrm{a}_{\mathrm{o}}=$ $\qquad$

