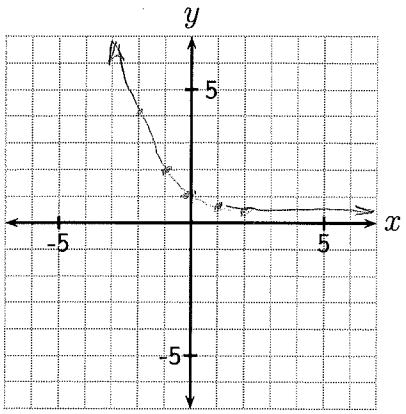
Math 111 EXAM 3 PART 1, SPRING 2018 **Name:** _____

You are not to use a calculator for this part of the exam. Each numbered exercise is worth 6 points.

1. Do the following for the function $y = 2^{-x}$:
   - Find at least five xy-pairs that satisfy the function and put them in the table given. **Include at least two negative values of x.**
   - Plot the graph of the function.

x	y
-2	4
-1	2
0	1
1	$\frac{1}{2}$
2	$\frac{1}{4}$



There is another on the back!

2. Find the value of each logarithm; show any work you do in the space provided. Put DNE for any that do not exist.

(a) $\log_3 -27 =$ DNE

Can't do a log of a negative

(b) $\log_2 \frac{1}{16} =$ -4

$2^4 = 16$

$2^{-4} = \frac{1}{16}$

(c) $\log_5 25 =$ 2

$5^2 = 25$

Math 111 EXAM 3 PART 2, SPRING 2018 **Name:** 69 points (2 on other part, one thrown out, so $6\times11+3=69$)

Each numbered exercise is worth 6 points, unless stated otherwise.

1. For $f(x)=x^2-5x$ and $g(x)=3x+1$, find and simplify $(f\circ g)(x)$, showing how you do it.

$(f\circ g)(x) = f[3x+1]$

$= (3x+1)^2 - 5(3x+1)$

$= 9x^2+6x+1-15x-5$

$(f\circ g)(x) = 9x^2-9x-4$

Idea, stopping +3

( )^2 +1

distribut +1

combine like terms, etc

2. Find the inverse of each function, and **give each using correct notation**.

(a) $f(x)=2x-7$

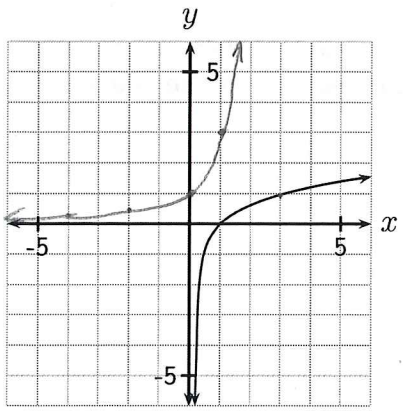
$f^{-1}(x) = \frac{x+7}{2}$

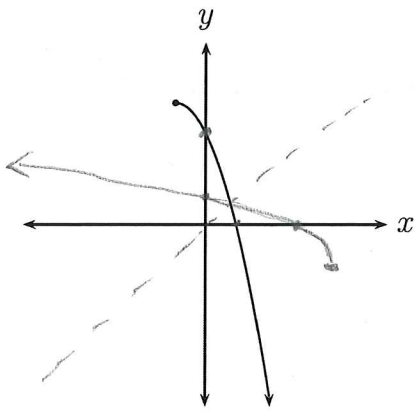
(b) $g(x)=5(x-2)^3$

$g^{-1}(x) = \sqrt[3]{\frac{x}{5}}+2$

(1) -2
(2) $\sqrt[3]{\ }$
(3) $\times 5$

3. Below are the graphs of two functions. Draw the inverse of each, **on the same graph**.





4. You invest 1200 at an annual interest rate of 3.5%, **compounded monthly**.

(a) How much will you have after 7 years? Show the formula you used to compute your answer. Other than that, no work need be shown for this. *3 points*

$A = 1200\left(1 + \frac{.035}{12}\right)^{12(7)} = \$1532.60$

(b) How long will it take to have $2000 (still investing 1200 at 3.5%, compounded monthly)? Show the equation you used and the algebra (**yes, ALL steps**) used to solve the equation. **Round your answer to the nearest tenth of a year, but don't round until the very end.** *6 points*

$2000 = 1200\left(1 + \frac{.035}{12}\right)^{12t}$ +1

$\frac{20}{12} = \left(1 + \frac{.035}{12}\right)^{12t}$ +1

$\log\left(\frac{5}{3}\right) = \log\left(1 + \frac{.035}{12}\right)^{12t}$ +1

$\log\left(\frac{5}{3}\right) = 12t \log\left(1 + \frac{.035}{12}\right)$ +1

$t = \frac{\log\left(\frac{5}{3}\right)}{12\log\left(1 + \frac{.035}{12}\right)}$ +1

$t = 14.6$ years +1

5. (a) Fill in the blanks: The half life of a medication is 2.5 hours. If you take 120mg, there will be 10mg left in your body between ~~10~~ 7.5 and ~~12.5~~ 10 hours later. **Show any work you do in the space below.**

(b) The doubling time for a population of fish in a lake is 3 years. If there are currently 3200 fish in the lake, how many were there 12 years ago? **Show any work you do in the space below and box your answer.**

t	A
0	120
2.5	60
5	30
7.5	15
10	7.5
12.5	3.75

t	N
0	200
3	400
6	800
9	1600
12	3200

200 fish

6. Solve $\log_5(ax) + b = d$ for x, showing *ALL* steps clearly.

$\log_5(ax) = d - b$

$ax = 5^{d-b}$

$x = \frac{5^{d-b}}{a}$

7. Write $\log\left(\frac{\sqrt{x}}{y^3}\right)$ in terms of $\log x$ and $\log y$. **Give your answer without negative or fractional exponents.**

$\log\sqrt{x} - \log y^3$

$\frac{1}{2}\log x - 3\log y$

8. Solve $\log_2(x-3)+\log_2(x-1)=3$ for x. **Show all steps used to solve the equation.**

$\log_2(x-3)(x-1)=3$ +1分

$\log_2(x^2-4x+3)=3$ +½

$x^2-4x+3=2^3$ +½

$x^2-4x-5=0$

$(x-5)(x+1)=0$ solve +1分

$x=-1, 5$

-1 +1

9. When a fisheries biologist first begins studying fish in a particular lake, there are 850 fish in the lake. Two years later there are 1430 fish in the lake. Assuming that the population of fish in the lake is growing exponentially, how many fish would we expect there to be in the lake five years after the biologist began studying the lake?

$A=850e^{kt}$

$1430=850e^{2k}$

$\frac{143}{85}=e^{2k}$

$\ln\left(\frac{143}{85}\right)=\ln e^{2k}$

$\ln\left(\frac{143}{85}\right)=2k$

$k=\frac{\ln\left(\frac{143}{85}\right)}{2}=0.26$

$A=850e^{0.26t}$

$A=850e^{0.26(5)}$

$A=3119$ fish

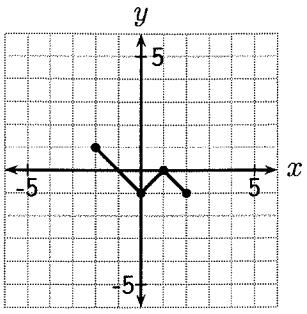
10. The graph of a function $h(x)$ is shown below and to the right. Match each of the given functions with the correct graphs below, by putting the correct Roman numeral in each blank. **If the correct graph is not shown, put NS in the blank.**

III (a) $y = h(x-2)$

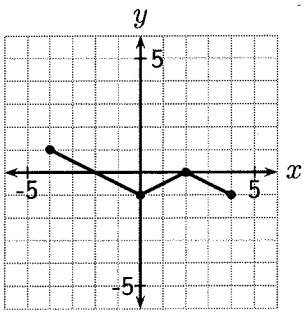
I (b) $y = h(\frac{1}{2}x)$

NS (c) $y = -h(x)$

IV (d) $y = h(x)+2$



I.



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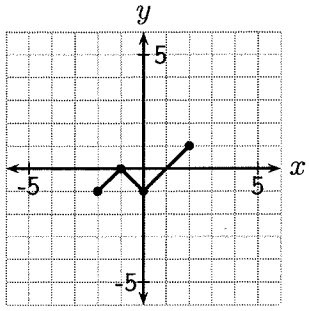

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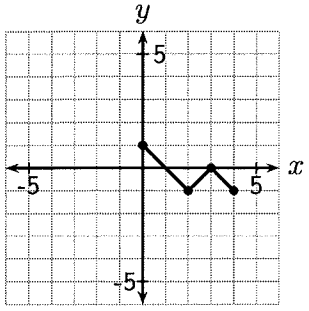

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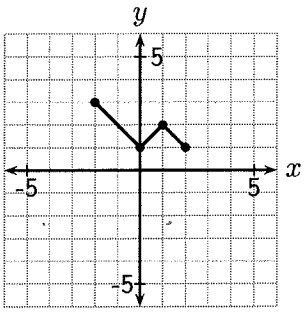

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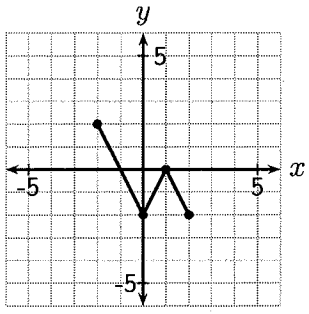

VI.