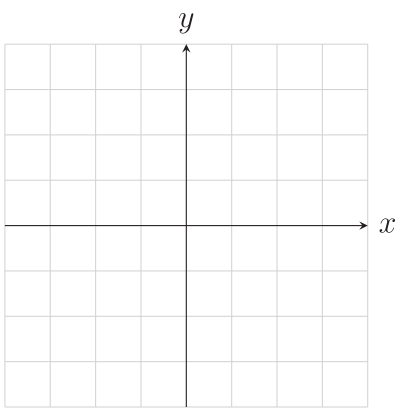
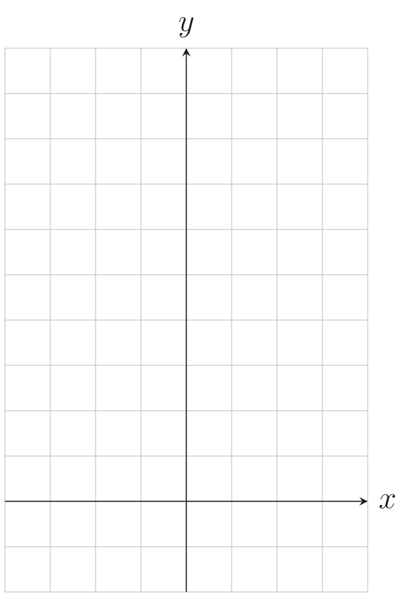
Math 111 Exam 2 Review Part I Name: ______________________________

1. Sketch the following functions from memory. Include key points/asymptotes.

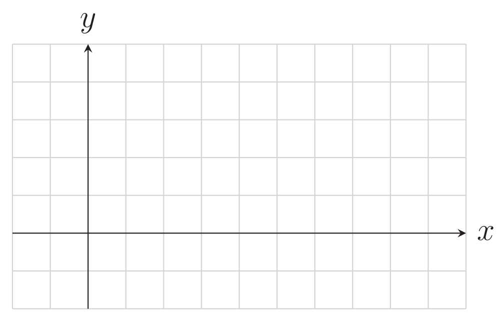
a. Graph $lin(x) = x$.



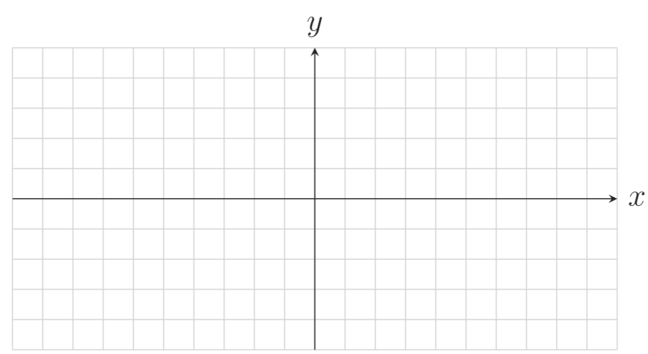

b. Graph $sqr(x) = x^2$.



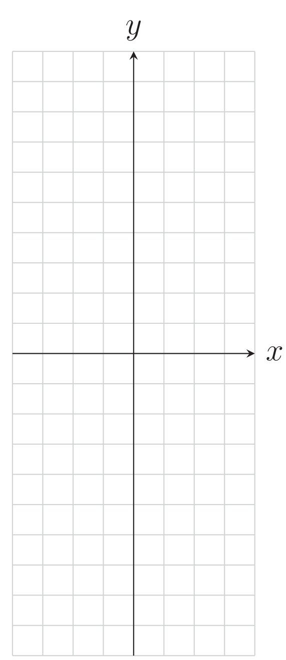

c. Graph $sqrt(x) = \sqrt{x}$.



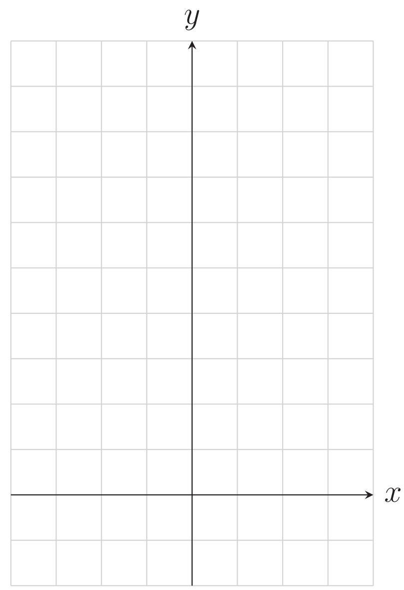

d. Graph $cubert(x) = \sqrt[3]{x}$



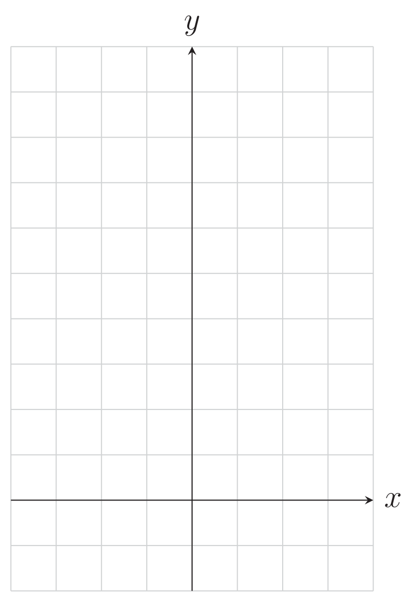

e. Graph $cube(x) = x^3$.



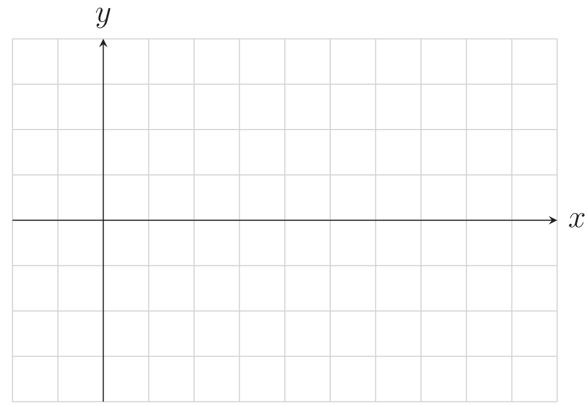
f. Graph $exp_2(x) = 2^x$.



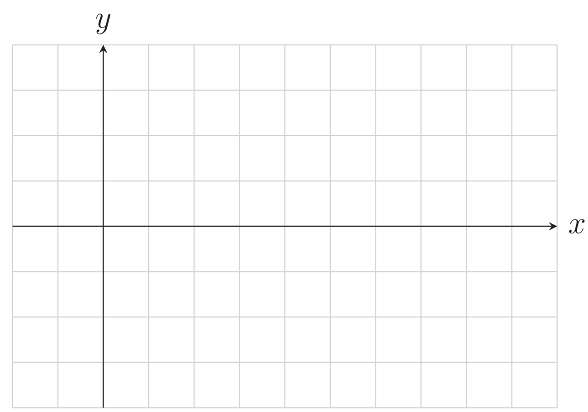

g. Graph $exp(x) = e^x$.




h. Graph $f(x) = \log_2(x)$.




i. Graph $h(x) = \ln(x)$.



Math 111 Exam 2 Review Part II, Calculator Okay

Name: ______________________________

1. Determine the domains and ranges of the following functions. You may need to graph them on your calculator or in Desmos in order to find the ranges.

   a. $f(x) = \dfrac{x+3}{x^2+x-2}$

   b. $g(x) = 2\sqrt{x+2}+2$

2. Given the function $f(x) = 2x+7$, find $\dfrac{f(x+h)-f(x)}{h}$.

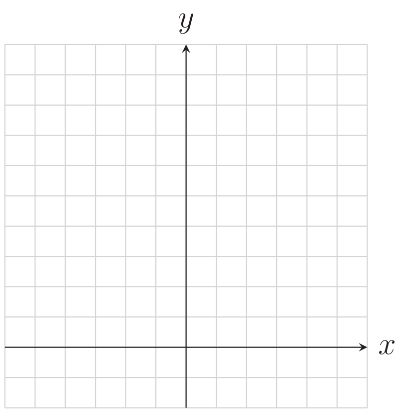
3. Approximate the following values by first applying the change of base formula.

a. $\log_5(89)$

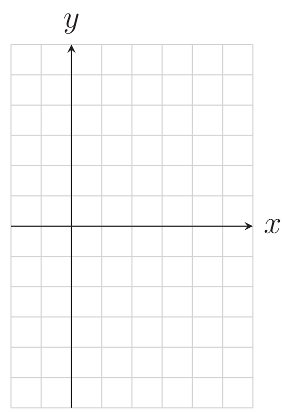
b. $\log_{\sqrt{2}}(\sqrt{5})$

4. Solve the following equations by graphing. You may use your calculator on these problems.

a. $e^x = x^2$




b. $e^x - \ln(x) = 4$



Math 111 Exam 2 Review Part II, No Calculator

Name: ______________________________

5. Let $f$ and $g$ be two functions defined as

$$f(x) = \frac{3}{x} \quad \text{and} \quad g(x) = \frac{1}{x+5}.$$

Find the following and find the domain in each case.

a. $(f+g)(x)$

c. $(f \circ g)(x)$

b. $(g \circ g)(x)$

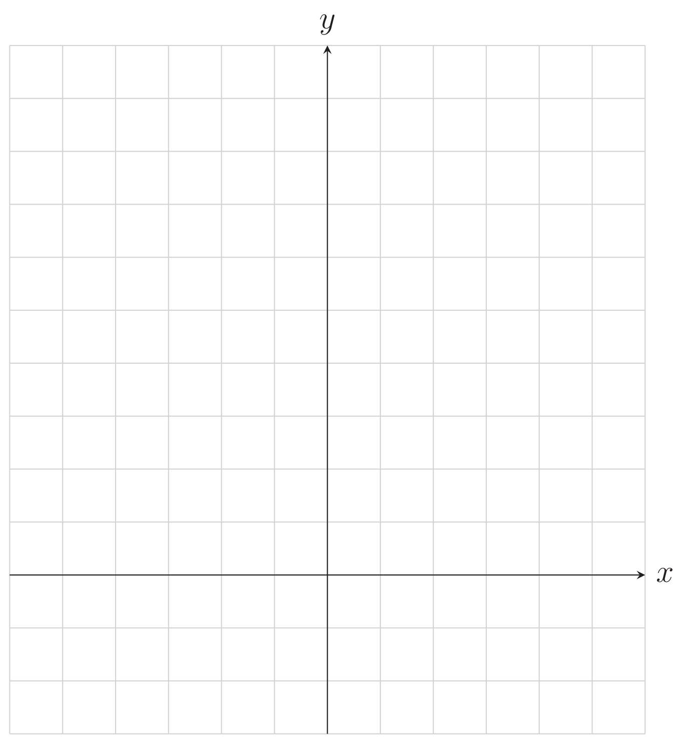
d. $\left(\frac{f}{g}\right)(x)$

6. Find functions $f$ and $g$ such that $f \circ g = K$ if $K(x) = \sqrt{2x+3}$. In fact, find two *non-trivial* (no $f(x) = x$ or $g(x) = x$) solutions to this exercise.

7. A function $f$ defined as

$$f(x) = \begin{cases} \frac{1}{2}x + 5 & \text{if } -4 \leq x < -2 \\ 4 & \text{if } -2 < x < 1 \\ (x-1)^2 + 1 & \text{if } x > 1 \end{cases}$$

a. Graph $y = f(x)$.



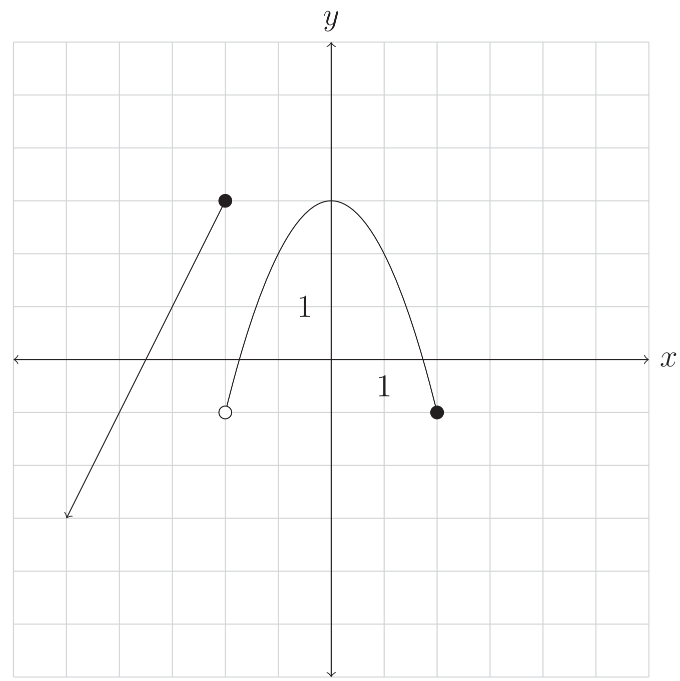

b. Find $f(-2)$, $f(1)$, and $f(2)$.

d. Determine the domain and range of $f$.

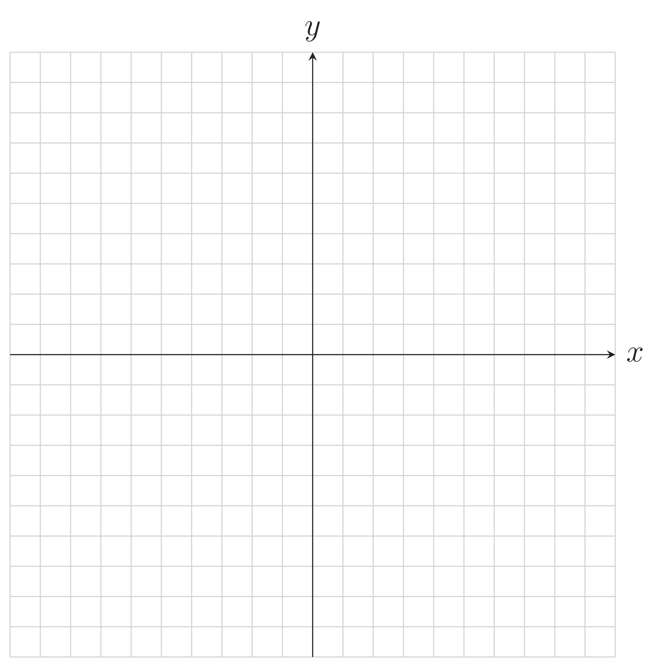
c. Locate any intercepts.

(a) Is $f$ continuous *on its domain*?

8. The graph of a piecewise-defined function is given. Write a definition for the function.




9. Use a transformation of $sqrt(x) = \sqrt{x}$ to graph $g(x) = 3 \cdot \sqrt{\left(-\frac{1}{2}x\right)} - 2$



10. Verify that the inverse of $f(x) = 3x - 1$ is $f^{-1}(x) = \frac{1}{3}(x+1)$.

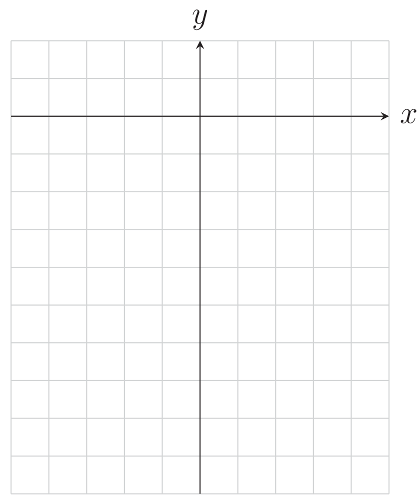
11. Determine the inverse of the function $f(x) = \dfrac{x+3}{x}$ and then state the domain and range of both.

12. Determine an exponential function of the form $f(x) = A \cdot b^x$ which passes through the two given points.

a. $\left(-1, \frac{2}{3}\right)$ and $(2, 18)$

b. $\left(-3, \frac{27}{16}\right)$ and $\left(3, \frac{4}{27}\right)$

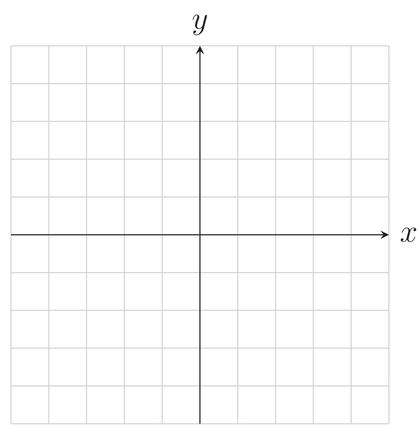
13. Graph $g(x) = -e^{x-3}$ using transformations and state the domain, range, and horizontal asymptote of $g$.




14. Consider $f(x) = 3\log(x-1)$

a. Find $f^{-1}$

b. Graph $f$ and $f^{-1}$ on the same coordinate plane.




c. State the domain and range and asymptote of both $f$ and $f^{-1}$

15. Evaluate the following expressions.

a. $\log_3\left(\frac{1}{27}\right)$

b. $\log_{\frac{1}{2}}(8)$

c. $\log_a(1)$

d. $\log_a(a)$

e. $2^{\log_2(\pi)}$

f. $\log_{0.2}\left(0.2^{-\sqrt{2}}\right)$

g. $\ln e^{kt}$

h. $e^{\ln(1/2)\cdot t/3}$

16. Write the following expressions as a sum or difference of logarithms, pulling any exponents out of the logarithm by the end of the process.

a. $\log_a\left(x\sqrt{x^2+1}\right)$, $x > 0$

b. $\log_a\left(\frac{\sqrt{x^2+1}}{x^3(x+1)^4}\right)$, $x > 0$

17. Write each of the following sums or differences of logarithms as a single logarithm.

a. $\log_a(x)+2\log_a(9)-\frac{1}{3}\log_a(x^2+1)-\log_a(5)$

b. $21\log_3(\sqrt[3]{x})+\log_3(9x^2)-\log_3(9)$

18. Solve the following equations involving exponentials or logarithms exactly.

a. $\log_5(x+6) + \log_5(x+2) = 1$

c. $8 \cdot 3^x = 5$

b. $\ln(x) = \ln(x+6) - \ln(x-4)$

d. $5^{x-2} = 3^{3x+2}$

19. The doubling time of a certain virus population (given unlimited room to grow and resources to consume) is about 25 days. Suppose that the virus is initially occupying 2 $\text{cm}^3$ of an organic tissue being studied. Determine an exponential function modeling the growth of the virus where the input is time, $t$, in days, and the output is the volume, $V$, in cubic centimeters, the virus is infecting. How much of the tissue is infected after 90 days? How long will it take for the virus to spread to 350 $\text{cm}^3$ of tissue?

20. You invest \$5500 into an account which pays out at 1.58% interest compounded monthly. Determine a function which models the amount of money you have in the account after $t$-years assuming you make no withdrawals or deposits. What is the 1-year factor of growth and 1-year effective growth rate? How much money will be in the account after 20 years? How long will it take for the account to amass \$10,000?