Exam 2 Math 1112 sec. 54 Spring 2019

Name: Solutions

Your signature (required) confirms that you agree to practice academic honesty.

Signature: _____

Problem	Points
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

INSTRUCTIONS: There are 10 problems; point values are listed with the problems. There are no notes or books, allowed and **no calculator is allowed. Illicit use of a calculator, smart phone, tablet, device that runs apps, or notes will result in a grade of zero on this exam as well as a formal allegation of academic misconduct.** To receive full credit, answers must be clear, complete, and written using proper notation.

1. (6 points—2 each) Complete the following.

(a) Complete the definition:
A function f is called an *even function* if $f(-x) = f(x)$

for each x in its domain.

(b) Complete the definition:
A function f is called an *odd function* if $f(-x) = -f(x)$

for each x in its domain.

(c) Let $g(x)$ be any function whose domain is all real numbers. Show that

$$F(x) = g(x) - g(-x)$$

is an odd function.

$F(-x) = g(-x) - g(-(-x))$

$= g(-x) - g(x)$

$= -(g(x) - g(-x)) = -F(x)$

Hence F is odd.

2. (20 points—5 each) Consider the functions f and g given by

$$f(x) = |x| \quad \text{and} \quad g(x) = x^2$$

On the grids provided, plot each of the following equations involving these two functions.

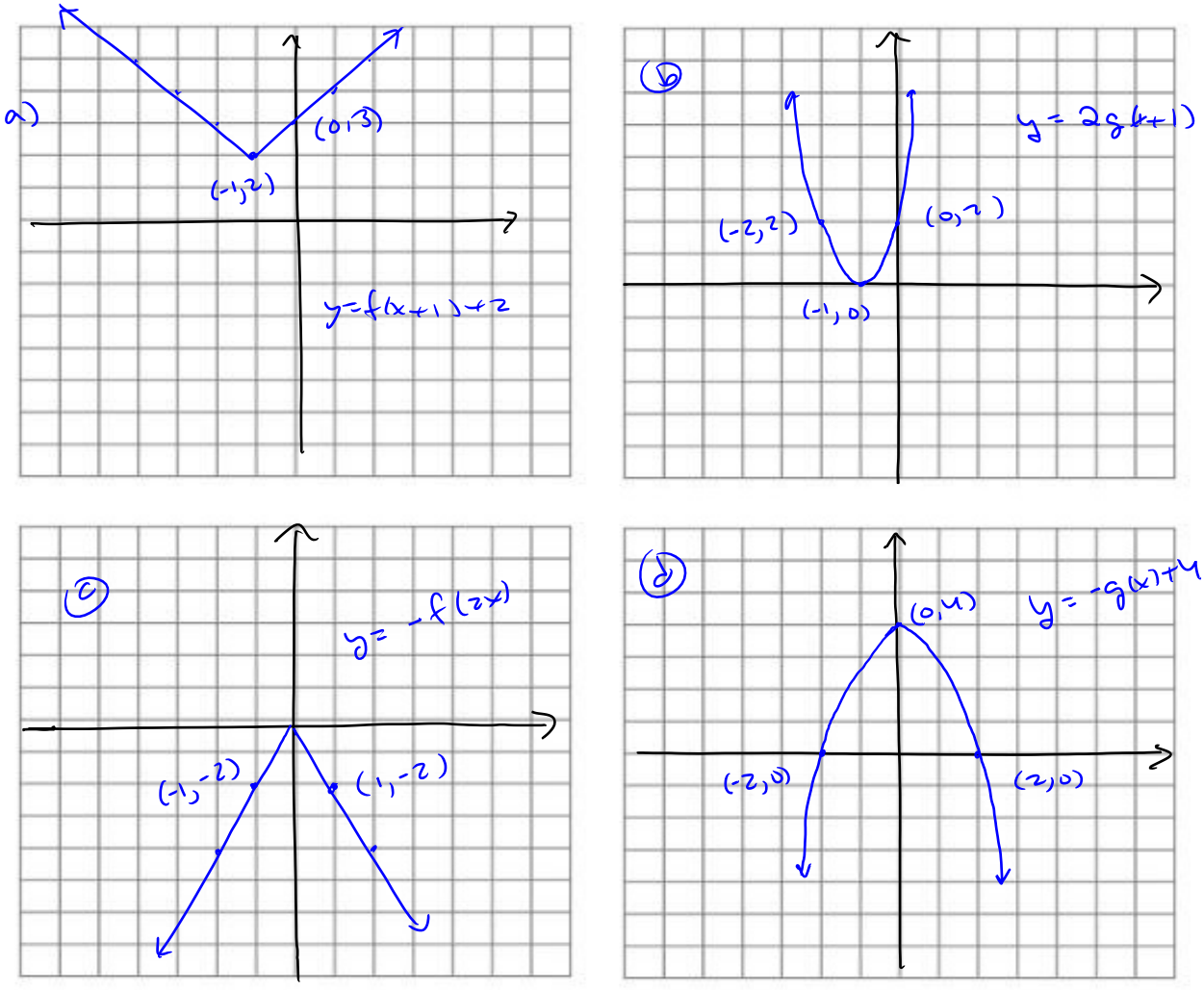
(a) $y = f(x+1) + 2$

(b) $y = 2g(x+1)$

(c) $y = -f(2x)$

(d) $y = -g(x) + 4$

Label each grid with (a), (b), (c) or (d) to identify which plot is which. Your plots should include the coordinate axes, and have at least two points on each curve labeled. (You can choose which points to label; intercepts may be a good choice.)



3. (12 points—2 each) Evaluate each expression exactly.

(a) e^0 = 1

(b) $\ln(e^2)$ = 2

(c) $3^{\log_3(4)}$ = 4

(d) $\log_2\left(\frac{1}{2}\right)$ = -1

(e) $e^{\ln 5}$ = 5

(f) $4^{2\log_4(3)}$ = $3^2 = 9$

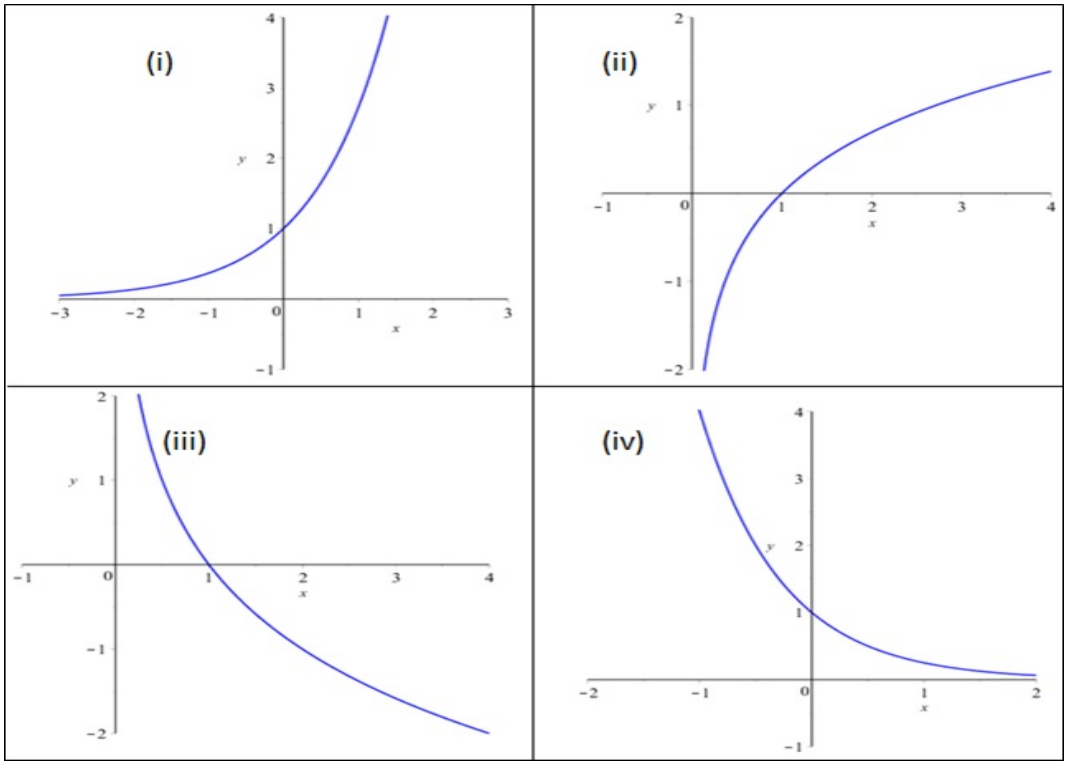
4. (8 points—2 each) The figure shows plots of four different functions. For each of the four different functions listed, identify which of the plots, (i), (ii), (iii), or (iv) shows the corresponding graph.

(a) $y = \ln(x)$ (ii)

(b) $y = \log_{\frac{1}{2}}(x)$ (iii)

(c) $y = \left(\frac{1}{4}\right)^x$ (iv)

(d) $y = e^x$ (i)



5. (10 points) Use properties of logarithms to simplify the following into a single logarithm.

$2\ln(x)+5\ln(z)-\frac{1}{2}\ln(y+1)+\ln(3)$ $= \ln x^2 + \ln z^5 - \ln\sqrt{y+1} + \ln 3$

$= \ln\left(\frac{3x^2z^5}{\sqrt{y+1}}\right)$

6. (15 points) Solve the exponential equation. Your solution should be exact. It may be necessary to leave your answer in terms of logarithms.

$9^x = 4^{x+3}$ $\quad \ln 9^x = \ln 4^{x+3} \Rightarrow x\ln 9 = (x+3)\ln 4$

$x\ln 9 - x\ln 4 = 3\ln 4$

$x(\ln 9 - \ln 4) = 3\ln 4$

$x = \frac{3\ln 4}{\ln 9 - \ln 4}$

can be written as $x = \frac{\ln 64}{\ln\left(\frac{9}{4}\right)}$

7. (15 points) Find all solutions of the logarithmic equation.

$\log(x) + \log(x-3) = 1$ (Hint: $\log(10) = 1$)

$\log x + \log(x-3) = \log 10$

$\log(x(x-3)) = \log 10 \Rightarrow x(x-3) = 10$

$x^2 - 3x - 10 = 0$

$(x+2)(x-5) = 0 \Rightarrow x = 5$ or $x = -2$

Check: $\log 5 + \log(5-3) = \log(5\cdot 2) = \log(10) = 1$

$\log(-2) + \log(-2-3)$ undefined

There is one solution $x = 5$

8. (5 points—1 each) Let $\theta = 20°$. Identify each of the following:

(a) The complementary angle for θ is $70°$. $90° - 20°$

(b) The supplementary angle for θ is $160°$. $180° - 20°$

(c) A positive angle that is co-terminal to θ is $380°$. $20° + 360°$

(d) A negative angle that is co-terminal to θ is $-340°$. $20° - 360°$

(e) The radian measure of θ is $\pi/9$. $\frac{20}{180} = \frac{1}{9}$

9. (5 points) Fill in the missing cells in the table containing degree and radian measure for some common angles.

$\theta°$	$0°$	$30°$	$45°$	$60°$	$90°$
θ (radians)	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$

10. (4 points—2 each) Solve for x. Your answers should be exact rational numbers.

(a) $x = \log_{\sqrt{2}}(\sqrt[5]{8})$ $\quad (\sqrt{2})^x = \sqrt[5]{8} \quad 2^{x/2} = 8^{\frac{1}{5}} = 2^{3/5}$

$\frac{x}{2} = \frac{3}{5} \Rightarrow \boxed{x = \frac{6}{5}}$

(b) $\log_{(x-5)}(32) = -5$ $\quad (x-5)^{-5} = 32 = 2^5 = \left(\frac{1}{2}\right)^{-5}$

$x - 5 = \frac{1}{2} \Rightarrow x = 5 + \frac{1}{2} = \frac{11}{2}$

$\boxed{x = \frac{11}{2}}$