

MAC 1140, Fall 2017.

Exam #3

October 30, 2017

Name key

- You will be told when to begin the work and when to terminate work on the examination. You must stop when instructed. Points may be deducted in case of violations.
- Please show your work to support your answers that require calculations. Correct but unsupported answers may not be given full credit.
- The use of a cell phone or other electronic communication devices during the examination is not allowed. The exam will be canceled and a grade of "0" will be assigned to anyone who uses a cell phone during the examination or if one is found within hands reach.
- Calculators are not allowed on this exam.
- The exam consist of two parts. Part I contains five multiple choice questions worth 5 points each. Part II contains 5 open ended questions worth 17 points each if not stated otherwise.

Part I

Choose your answer from five available choices. No partial credit will be given for wrong answers.

1. Which of the following is an exponential function

- (a) $y = 5^{x+3}$
- (b) $y = \frac{2x-1}{x^2+1}$
- (c) $y = x^3$
- (d) $y = 2x - 1$
- (e) None of the above

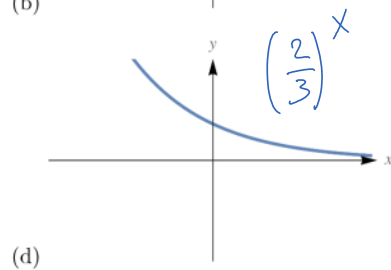
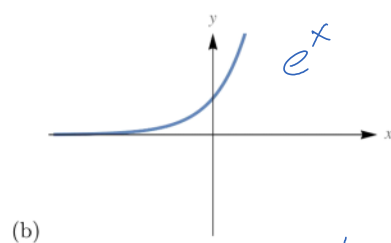
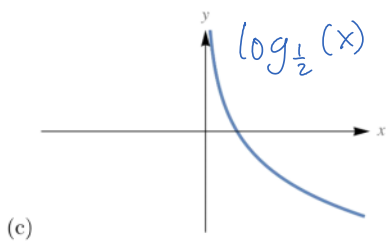
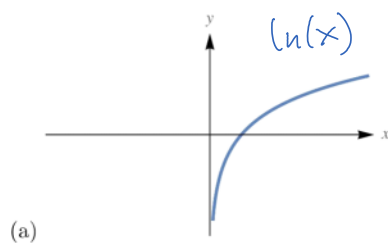
2. The value of $\log_4(-2)$ is

- (a) -1
- (b) $1/2$
- (c) $\sqrt{2}$
- (d) 16
- (e) None of the above

3. The equivalent exponential form of the equation $\log_2(5) = a$ is

- (a) $2^5 = a$
- (b) $2^a = 5$
- (c) $5^a = 2$
- (d) $5^2 = a$
- (e) None of the above

4. The graphs of functions $y = e^x$, $y = (2/3)^x$, $y = \ln(x)$, and $y = \log_{1/2}(x)$ are given below, not necessarily in that order. Match each graph with an appropriate equation.



5. The expression $2 \log(x) - \log(y) - 3 \log(z)$ can be condensed to the following form.

(a) $\log\left(\frac{x^2 z^3}{y}\right)$

(b) $\log\left(\frac{2x}{yz^3}\right)$

(c) $\log\left(\frac{x^2}{yz^3}\right)$

(d) $\frac{\log x^2}{\log(yz^3)}$

(e) None of the above

Part II

6. Solve the equation.

$$\log_2(x+2) + \log_2(x+5) = 2$$

$$\log_2((x+2)(x+5)) = 2$$

$$(x+2)(x+5) = 2^2$$

$$x^2 + 7x + 10 = 4$$

$$x^2 + 7x + 6 = 0$$

$$(x+6)(x+1) = 0$$

$$\underline{x = -6}$$

$$\underline{x = -1}$$

Test:

$$\log_2(-6+2) + \log_2(-6+5) = 2$$

$$\log_2(-4) + \log_2(-1) = 2$$

$x = -6$ is not
a solution.

$$\log_2(-1+2) + \log_2(-1+5) = 2$$

$$\log_2(1) + \log_2(4) = 2$$

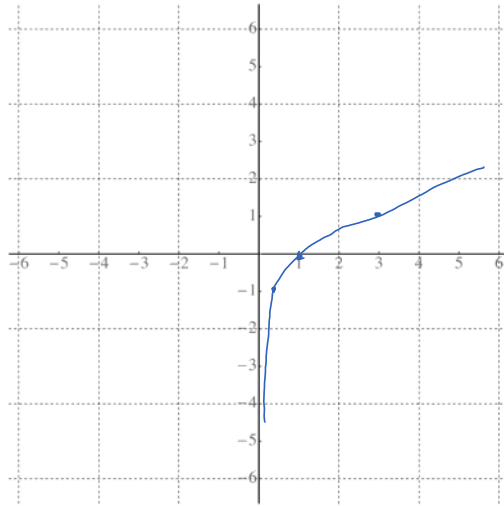
$$0 + 2 = 2 \checkmark$$

$$\boxed{x = -1}$$

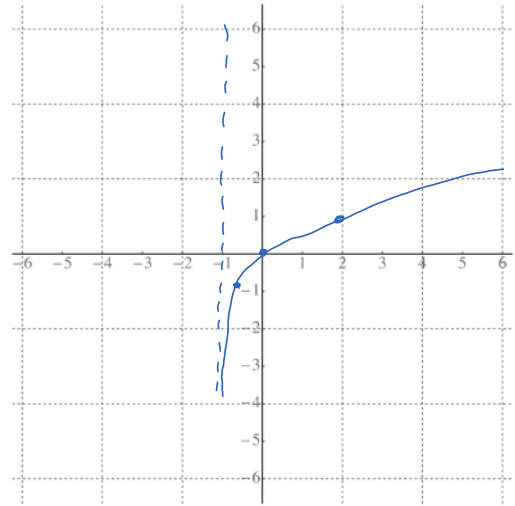
7. Graph $y = 4 \cdot \log_3(x+1) + 1$ using transformations. Start with the graph of a basic function – **plot accurately as least three points** and use them to perform transformations. Do one transformation at a time. Name the transformation and write the equation of the resulting function.

(i) Basic function:

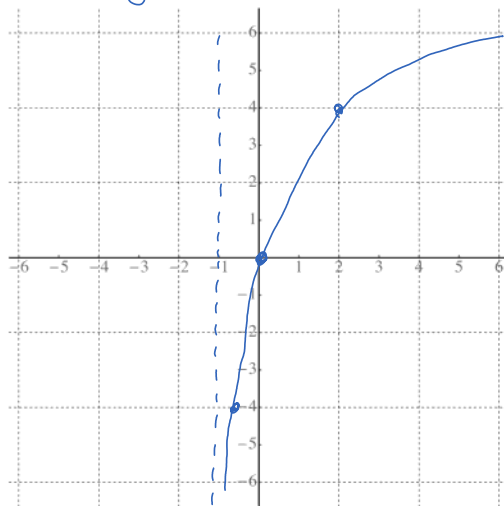
$$y = \log_3 x$$



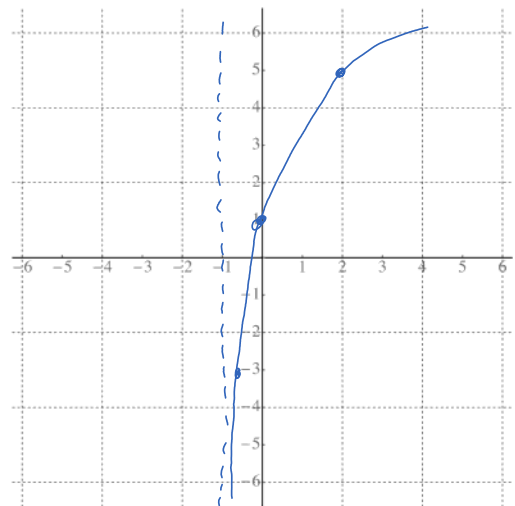
(ii) transformation: *hor. shift left 1*
 $y = \log_3(x+1)$



(iii) transformation: *vert. stretch by 4*
 $y = 4 \log_3(x+1)$



(iv) transformation: *vert. shift up 1*
 $y = 4 \log_3(x+1) + 1$



8. Solve the equation.

$$3 + e^{2x-1} = 5$$

$$e^{2x-1} = 5 - 3$$

$$e^{2x-1} = 2$$

$$2x-1 = \ln 2$$

$$2x = \ln 2 + 1$$

$$x = \frac{1 + \ln 2}{2}$$

9. Write as the sum and/or difference of logarithms. Express powers as factors.

$$\ln \left(\frac{(x-2)^3}{x^5(x+1)^3} \right)$$

$$3 \ln(x-2) - 5 \ln x - 3 \ln(x+1)$$

10. Find the domain of the following function. Show your work.

$$f(x) = \log\left(\frac{1}{2} - 3x\right)$$

$$\frac{1}{2} - 3x > 0$$

$$\frac{1}{2} > 3x$$

$$\frac{1}{6} > x$$

$$\left(-\infty, \frac{1}{6}\right)$$