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.

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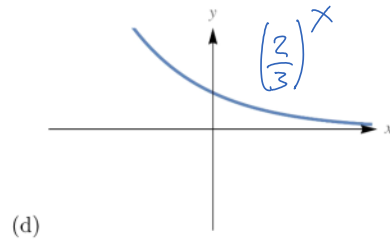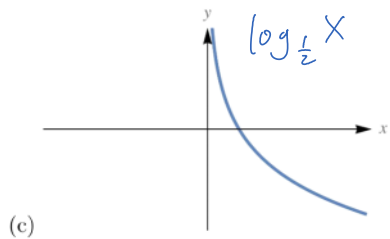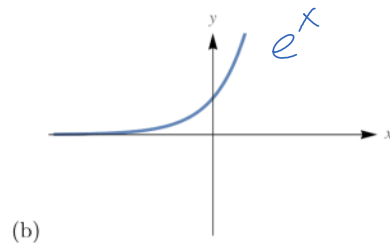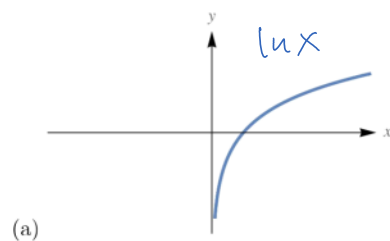   - (d) $y = \frac{2x-1}{x^2+1}$
   - (e) None of the above

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 $\log_2(a) = 5$ 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.

$\ln x$

(a)

e^x

(b)

$\log_{\frac{1}{2}} x$

(c)

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

(d)

2

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

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

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

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

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

(e) None of the above

Part II

6. Solve the equation.

$$\log_2(x+3) + \log_2(x+4) = 1$$

$$\log_2\left((x+3)(x+4)\right) = 1$$

$$\downarrow$$

$$(x+3)(x+4) = 2^1$$

$$x^2 + 7x + 12 = 2$$

$$x^2 + 7x + 10 = 0$$

$$(x+5)(x+2) = 0$$

$x = -5$ $\qquad x = -2$

check:

$\log_2(-5+3) + \log_2(-5+4) = 1$ $\qquad \log_2(-2+3) + \log_2(-2+4) = 1$

$x = -5$ is not a solution $\qquad \log_2(1) + \log_2(2) = 1$

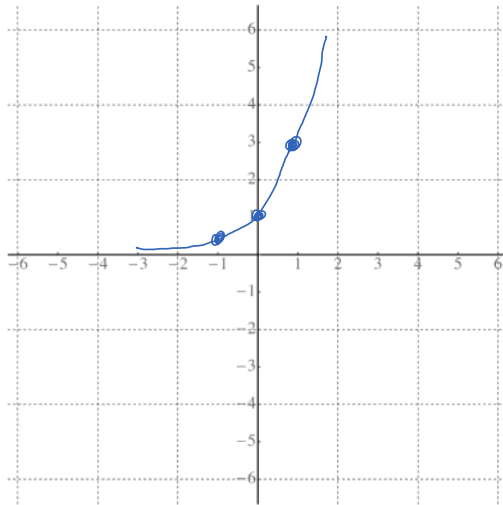$\qquad\qquad\qquad\qquad\qquad 0 + 1 = 1$ ✓

$$\boxed{x = -2}$$

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7. Graph $y = 2 \cdot 3^{x+1} - 4$ 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.
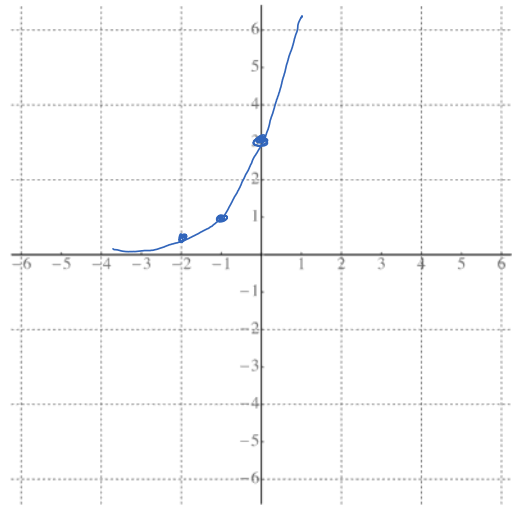
(i) Basic function:

y= 3^x
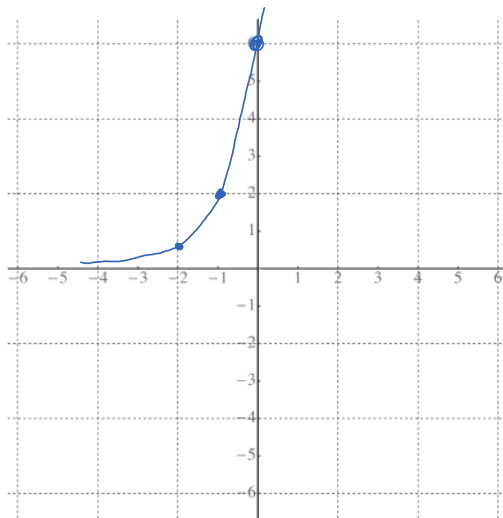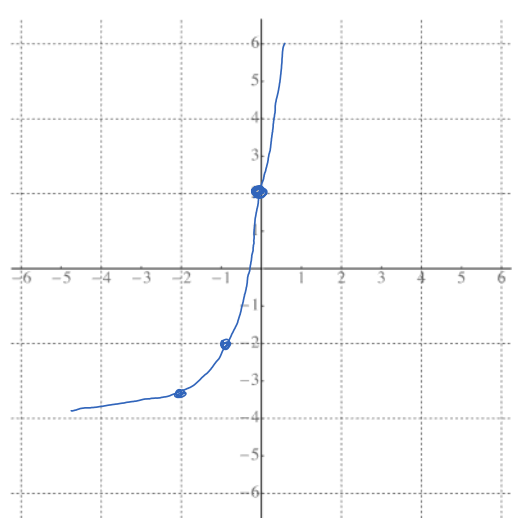
(ii) transformation: hor. shift left 1

y= 3^{x+1}

(iii) transformation: vert. stretch by 2

y= $2 \cdot 3^{x+1}$

(iv) transformation:

y= $2 \cdot 3^{x+1} - 4$

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8. Solve the equation.
$$2 + e^{3x-1} = 4$$

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

$$(3x-1)\ ln\ e = ln\ 2$$

$$3x - 1 = ln\ 2$$

$$3x = 1 + ln\ 2$$

$$x = \boxed{\dfrac{1 + ln\ 2}{3}}$$

9. Write as the sum and/or difference of logarithms. Express powers as factors.
$$\ln\left(\frac{x^3}{(x-2)^5(x+1)^3}\right)$$

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

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

$$f(x) = \log\left(\frac{1}{5} - 2x\right)$$

$$\frac{1}{5} - 2x > 0$$

$$\frac{1}{5} > 2x$$

$$\frac{1}{10} > x \qquad \boxed{\left(-\infty, \frac{1}{10}\right)}$$

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