Math 110, Sections 7-17, 22-23 including SL Center (College Algebra)

RED-DO NOT WRITE ON THIS EXAM

Midterm Exam 3 Fall 2014, October 30 - November 5, 2014

1. Evaluate $(f \circ g)(3)$ using the values in the given table.

x	-3	-2	-1	0	1	2	3
f(x)	-9	-7	-5	-3	-1	1	3
g(x)	3	2	1	0	-1	-2	-3

a) -3 b) -1 c) 1
d) 3 e) 0 f) -9

2. Find the domain of $f \circ g$ if

$$f(x) = \log_2(x) \qquad \text{and} \qquad g(x) = 4 - x.$$

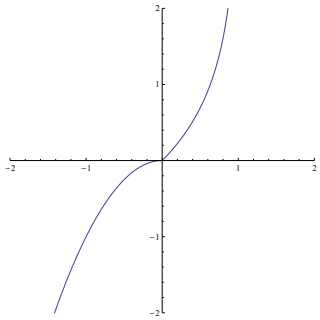
a) $(-\infty, \infty)$ b) $(-\infty, 4]$ c) $(0, \infty)$
d) $[0, \infty)$ e) $(-\infty, 4)$ f) $(-\infty, 0)$

3. The following function is one-to-one. Find it's inverse.

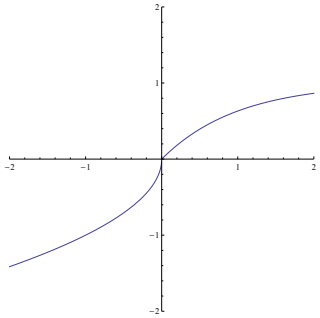
$$f(x) = \frac{6x + 5}{2 - x}$$

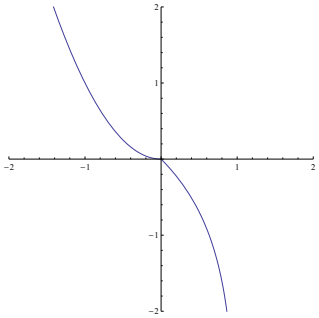
a) $f^{-1}(x) = \dfrac{2x - yx - 5}{6}$ b) $f^{-1}(x) = \dfrac{2x - 5}{6 + x}$
c) $f^{-1}(x) = \dfrac{2 - x}{6x + 5}$ d) $f^{-1}(x) = \dfrac{2 - 6x}{x + 5}$
e) $f^{-1}(x) = 3x - \dfrac{5}{x - 2}$ f) None of the above

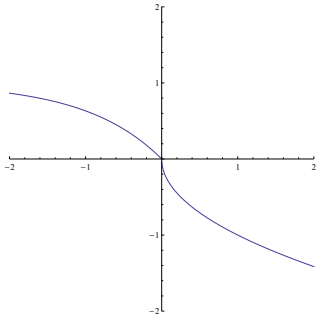
4. The graph of $f(x)$ is given here:

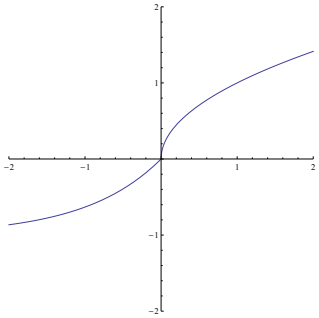


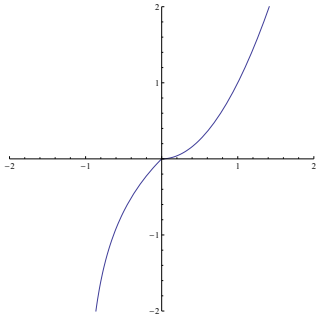
Which of the following is the graph of $f^{-1}(x)$?

a) 

b) 

c) 

d) 

e) 

f) None of the above

5. The equation

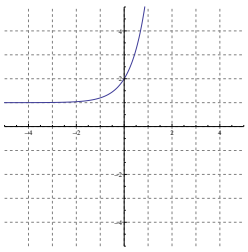
$$\left(\frac{e^x}{e^5}\right)^x = e^6$$

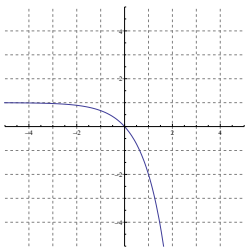
has two solutions. What is the sum of these two solutions?

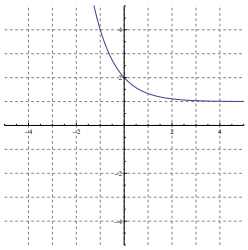
a) 1 b) 6 c) -5
d) -2 e) 5 f) 17

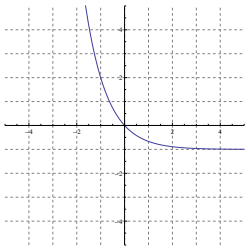
6. Which of the following is the graph of the function below?

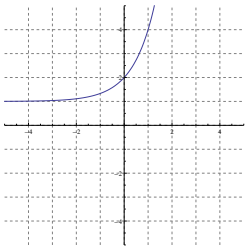
$$f(x) = 3^x + 1$$

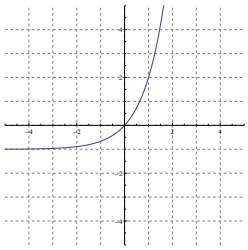
a) 

b) 

c) 

d) 

e) 

f) 

7. If $f(x) = 3^x$ what is $f^{-1}(x)$?

a) $\log_3 x$
b) $\ln x^3$
c) $\dfrac{\ln 3}{\ln x}$
d) $\log_3 \dfrac{1}{x}$
e) $\log x$
f) None of the above

8. Simplify the expression.

$$\log_8(49)\log_7(9)\log_3(8)$$

a) 10
b) $\ln 84$
c) $\dfrac{1}{4}\ln 20$
d) 4
e) $\ln 4$
f) $\ln \dfrac{20}{3}$

9. Solve the equation

$$e^{6x} = 8.$$

Give your answer in simplest form.

a) $\dfrac{4}{3}$
b) $\ln \dfrac{4}{3}$
c) $\ln 4$
d) $\dfrac{2}{3}\ln 2$
e) $\dfrac{1}{2}\ln 2$
f) $\ln 48$

10. Write as a single logarithm.

$$\log_5(90) - (\log_5(3) + \log_5(10))$$

a) $\log_5 \dfrac{200}{3}$ b) $\log_5 \dfrac{1}{6}$ c) $\log_5 \dfrac{10}{3}$
d) $\log_5 3$ e) $\log_5 270$ f) None of the above

11. How many years would it take for an investment to **double** if it is in an account that earns an annual interest rate of 10% compounded continuously?

a) $\dfrac{1}{5}\ln 1$ b) $.1 \ln 2$ c) $10 \ln 2$
d) $\dfrac{1}{2}\ln 10$ e) $\dfrac{1}{10}\ln 5$ f) None of the above

12. Write the expression as a single logarithm.

$$\log_3(x-5) + 2\log_3(x+1) - \log_3(x^2 - 4x - 5)$$

a) $\log_3(x-5)^2$ b) $\log_3(x-5)$
c) $\log_3(x+1)$ d) $\log_3 \dfrac{1}{x+1}$
e) $\log_3((x+1)^2(x-5)(x^2-4x-5))$ f) None of the above

13. Find the solution set to the following equation:

$$9^x = 2(3^x) + 3.$$

a) $\{1, 3\}$ b) $\{-1, 3\}$
c) $\{1, \log_3 -1\}$ d) $\{1\}$
e) $\{3\}$ f) $\{0\}$
g) No solution

14. Find $(f \circ g)(x)$ if

$$f(x) = \frac{3x+1}{2x-3} \qquad \text{and} \qquad g(x) = \frac{x-1}{x+2}.$$

a) $(f \circ g)(x) = -\dfrac{4x-1}{x+8}$ b) $(f \circ g)(x) = -\dfrac{3x-1}{(x+2)^2}$
c) $(f \circ g)(x) = -\dfrac{(3x+1)(x-1)}{(2x-3)(x+2)}$ d) $(f \circ g)(x) = -\dfrac{(3x+1)(x+2)}{(2x-3)(x-1)}$
e) $(f \circ g)(x) = -\dfrac{x^2-1}{(2x-3)(x+2)}$ f) None of the above

15. Find the equation of a parabola for which the directrix is $y = 2$ and the **focus** is $(3, 0)$.

a) $(y-1)^2 = 4(x-3)$ b) $(x-3)^2 = (y-1)$ c) $(x-3)^2 = -4(y-1)$
d) $(x+3)^2 = 4(y+1)$ e) $(y-3)^2 = 8(x-1)$ f) $(x-3)^2 = -8(y-1)$

16. Find the domain of the following function:

$$f(x) = \ln\left(\frac{x+3}{x-1}\right).$$

a) $(-\infty, -3) \cup (1, \infty)$
b) $(-3, 1)$
c) $\left(-\infty, \frac{1}{-3}\right) \cup (1, \infty)$
d) $\left(\frac{1}{-3}, 1\right)$
e) $(-\infty, 1) \cup (1, \infty)$
f) None of the above

17. Find the solution set to the following equation:

$$\ln(x+5) + \ln(2x+1) = \ln(x^2 + 12x + 11).$$

a) {-3,2}
b) {-2,3}
c) {1,4}
d) {-4,1}
e) {3}
f) {-4}

18. Find the *focus* of the parabola

$$-8(x-2) = y^2 - 2y + 1.$$

a) $(0, 1)$
b) $(4, 1)$
c) $(-4, -1)$
d) $(2, 3)$
e) $(-6, 1)$
f) None of the above

19. A rare strain of bacteria grows according to the law of uninhibited growth. Initially, there are 100 bacteria. After 5 hours, the bacteria count is 1700. Give the equation that models the population N of the bacteria as a function of time t in hours.

a) $N(t) = 1700e^{\frac{t}{5}}$
b) $N(t) = 100e^{\frac{t}{5}}$
c) $N(t) = 100e^{t\frac{\ln 17}{5}}$
d) $N(t) = \frac{1700}{5}e^{\frac{t}{100}}$
e) $N(t) = 100e^{\frac{17t}{5}}$
f) None of the above

20. Solve the following equation:

$$5^x = 34.$$

a) $\ln 34$
b) $\ln 34 + \ln 5$
c) $\ln \frac{34}{5}$
d) $\frac{\ln 34}{\ln 5}$
e) $(\ln 34)(\ln 5)$
f) None of the above

Solution:

1. f
2. e
3. b
4. a
5. e
6. e
7. a
8. d
9. e
10. d
11. c
12. c
13. d
14. a
15. c
16. a
17. e
18. a
19. c
20. d