MATH 1103 COMMON FINAL EXAM
MULTIPLE CHOICE SECTION
Spring 2015

Please print the following information:

Name:	_____	Instructor:	_____
Student ID:	_____	Section/Time:	_____

The MATH 1103 Final Exam consists of two parts. These pages contain Part I which consists of 45 multiple choice questions. They are printed on the front and the back of each page. A special answer sheet is provided so that your answers can be machine graded.

Part II consists of free response questions prepared by your instructor. You have three hours for the entire test.

- You must use a pencil with a soft black lead (#2 or HB) to enter your answers on the answer sheet.
- For each question choose the response which *best* fits the question.
- If you wish to change an answer, make sure that you completely erase your old answer and any other extraneous marks.
- There is no penalty for guessing. However if you mark more than one answer to a question, that question will be scored as incorrect.
- You may perform your calculations on the test itself or on scratch paper, but do not make any stray marks on the answer sheet.
- *Make sure that your name appears on the answer sheet and that you fill in the circles corresponding to your name.*
- *The use of a TI-89 or a TI-92 calculator on this test is a violation of the Code of Student Conduct.*

At the end of the examination you MUST hand in this booklet, your answer sheet and all scratch paper.

1. Write the equation of the line that is perpendicular to $3x-4y=8$ and passes through the point (-2, 1).

(A) $3x+4y+2=0$
(B) $4x+3y+5=0$
(C) $-3x+4y+6=0$
(D) $3x-4y+10=0$
(E) $4x-3y+11=0$

2. Find the domain of the function $f(x)=\frac{1}{\sqrt{x-3}}+\frac{1}{\sqrt{12-2x}}$.

(A) $[3,\ 6)$
(B) $[3,\ 12)$
(C) $(-\infty,\ 3)\cup(6,\ \infty)$
(D) $(3,\ 6)$
(E) $(3,\ 12)$

3. The function $f(x)=x\sqrt{3-x^2}$ is _____.

(A) odd
(B) even
(C) neither even nor odd
(D) one-to-one
(E) not a function

4. Consider the piecewise defined function below and evaluate $f(-1)+f(2)$.

$$f(x)=\begin{cases}2x^2-3 & \text{for } x\le 0\\ e^{-x} & \text{for } x>0\end{cases}$$

(A) $\frac{1}{e^2}-1$
(B) $\frac{1}{e^2}-5$
(C) $\frac{1}{e^2}-3$
(D) e^2-1
(E) e^2-5

5. If the function $f(x)=4x^3+1$ is one-to-one function, find its inverse.

(A) $f^{-1}(x)=\dfrac{\sqrt[3]{x}-1}{4}$

(B) $f^{-1}(x)=\dfrac{\sqrt[3]{x-1}}{2}$

(C) $f^{-1}(x)=\sqrt[3]{\dfrac{x-1}{4}}$

(D) $f^{-1}(x)=\dfrac{x^3-1}{4}$

(E) The function is not one-to-one.

6. If you reflect the graph of $y=f(x)$ over the x-axis, stretch vertically by the factor of 3, then translate 7 units up, then you will get the graph of ____.

(A) $y=-\dfrac{1}{3}f(x-7)$

(B) $y=-3f(x)+7$

(C) $y=3f(-x)+7$

(D) $y=-\dfrac{1}{3}f(x+7)$

(E) $y=3f(x)-7$

7. Given $f(x)=3\sqrt{x}-2$ and $g(x)=\dfrac{1}{x+4}$, find $(g\circ f)(x)$.

(A) $\dfrac{3\sqrt{x}-2}{x+4}$

(B) $\dfrac{1}{3\sqrt{x+2}}$

(C) $\dfrac{3}{\sqrt{x+4}}-2$

(D) $\dfrac{3}{\sqrt{x+2}}$

(E) $\dfrac{1}{3\sqrt{x}+2}$

8. Which of the following functions is one-to-one?

(A) $f(x)=x^2$ on $(-\infty,\ \infty)$
(B) $f(x)=|x-1|$ on $(-1,\ \infty)$
(C) $f(x)=|x+1|$ on $(-\infty,\ 1)$
(D) $f(x)=(x-1)^2$ on $(-1,\ \infty)$
(E) $f(x)=1-x^2$ on $(-\infty,\ -1)$

9. For the function $g(x)=x^2-2x$, find $\dfrac{g(a+h)-g(a)}{h}$.

(A) $2a-2$
(B) $a+h$
(C) $h-2$
(D) $2a+h-2$
(E) $h^2+2ah-2h$

10. Evaluate $f^{-1}(2)$ for the function $f(x)=\dfrac{1-x}{x-5}$.

(A) $-\dfrac{1}{3}$
(B) $\dfrac{11}{3}$
(C) $\dfrac{7}{3}$
(D) -3
(E) Undefined

11. What is the remainder when $P(x)=2x^{101}-3x^8-11x+6$ is divided by $(x+1)$?

(A) -6
(B) -4
(C) 0
(D) 12
(E) 18

12. At which value of x has the function $f(x)=2(x+1)(x-3)-8$ a minimum?

(A) at $x=-1$
(B) at $x=1$
(C) at $x=2$
(D) at $x=3$
(E) This function has no minimum.

13. Given that $x=3$ is a zero of $f(x)=2x^3-5x^2-4x+3$, find all the other zeros of $f(x)$.

(A) $x=-1$ and $x=2$
(B) $x=1$ and $x=-\frac{1}{2}$
(C) $x=-1$ and $x=\frac{1}{2}$
(D) $x=2$ and $x=3$
(E) $x=3$ is the only zero.

14. Which of the following function graphs a parabola with the vertex at (-1, 4) and one of the x-intercept at -3?

(A) $f(x)=-x^2+4x-3$
(B) $f(x)=x^2-4x+3$
(C) $f(x)=-x^2-2x+3$
(D) $f(x)=x^2+2x-3$
(E) $f(x)=-3(x-1)^2+4$

15. A farmer has 100 yards of fencing material and wants to enclose a rectangular field that borders a straight river. He needs no fence along the river. What is the largest area that he can enclose?

(A) 50 square yards
(B) 250 square yards
(C) 625 square yards
(D) 1000 square yards
(E) 1250 square yards

16. Solve the inequality $3x^2 > 4x + 4$.

(A) $(3, \infty)$
(B) $(-\frac{2}{3}, 2)$
(C) $(-1, \frac{4}{3})$
(D) $(-\infty, -\frac{2}{3}) \cup (2, \infty)$
(E) $(-\infty, -1) \cup (\frac{4}{3}, \infty)$

17. Find the horizontal asymptote (HA) and the vertical asymptote (VA) of the function $f(x) = \dfrac{2x+6}{x^2-9}$.

(A) HA: $y = 3$ VA: $x = 0$
(B) HA: $y = 0$ VA: $x = 3$
(C) HA: $y = -3$ VA: $x = -3, \quad x = 3$
(D) HA: None VA: $x = -3$
(E) HA: $y = 2$ VA: None

18. Solve the inequality $\dfrac{x+3}{x-2} \geq 2$.

(A) $(2, 7]$
(B) $(2, 7)$
(C) $[-\frac{3}{2}, 2]$
(D) $(-\infty, 2) \cup [7, \infty)$
(E) $(-\infty, 2] \cup (7, \infty)$

19. Consider the exponential function $f(x) = Cb^x$ whose graph goes through the point $f(0) = \dfrac{1}{2}$ and $f(2) = 3$ Find the product of b and C.

(A) $\sqrt{3}$
(B) $\dfrac{\sqrt{6}}{2}$
(C) $\dfrac{3}{2}$
(D) $\pm\sqrt{3}$
(E) $\pm\dfrac{\sqrt{6}}{2}$

20. Find the estimated value of $\log_2(13.7)$ to the nearest hundredth.

(A) 1.66
(B) 1.92
(C) 3.78
(D) 3.94
(E) 8.69

21. Find the horizontal asymptote of the exponential function $f(x)=3^{1-x}-4$.

(A) $y=0$
(B) $y=1$
(C) $y=3$
(D) $y=-4$
(E) $y=-1$

22. Which of the following statements are true?

I. $(\log x)^5 = 5\log x$
II. $\ln(\sqrt{x}) = \frac{1}{2}\ln(x)$
III. $\ln(2x^4) = 4\ln(2x)$
IV. $\dfrac{\log a}{\log b} = \dfrac{\ln a}{\ln b}$
V. $\log(A-B) = \dfrac{\log A}{\log B}$

(A) I and II only
(B) I and III only
(C) II and IV only
(D) III and V only
(E) I, II, and V only

23. Write $\ln(x)+2\ln(y)-3\ln(z)$ as a single logarithm.

(A) $\ln(x+2y-3z)$
(B) $\ln(xy^2z^3)$
(C) $\ln\left(\dfrac{2xy}{3z}\right)$
(D) $\ln\left(\dfrac{xy^2}{z^3}\right)$
(E) $\ln\left(\dfrac{x+y^2}{z^3}\right)$

24. If $2,500 is invested into an account that pays 4% interest compounded monthly, how long (to the nearest month) would it take for the investment to double in value?

(A) 10 years 8 months
(B) 12 years 9 months
(C) 15 years 6 months
(D) 17 years 4 months
(E) 20 years 2 months

25. Solve the equation $\left(\frac{1}{e}\right)^{2-3x} = e^{2x}$.

(A) $x = -2$
(B) $x = -1$
(C) $x = 0$
(D) $x = 1$
(E) $x = 2$

26. Solve the equation $\ln x + \ln(x+2) = \ln 8$.

(A) $x = 2$
(B) $x = -4$
(C) $x = -4,\ x = 2$
(D) $x = 4$
(E) No solution

27. Find the angle that is co-terminal with $-\frac{2\pi}{3}$.

(A) $\frac{4\pi}{3}$
(B) $-\frac{4\pi}{3}$
(C) $-\frac{\pi}{3}$
(D) $\frac{\pi}{3}$
(E) $\frac{7\pi}{3}$

28. Convert $225°$ to radians. Express your answer as a multiple of π.

(A) $\frac{4\pi}{5}$
(B) $\frac{5\pi}{4}$
(C) $\frac{5\pi}{6}$
(D) $\frac{4\pi}{3}$
(E) $\frac{3\pi}{4}$

29. If $\csc\alpha < 0$ and $\cos\alpha > 0$, then in which quadrant does α lie?

(A) First quadrant
(B) Second quadrant
(C) Third quadrant
(D) Fourth quadrant
(E) Cannot be determined

30. Find the range of the trigonometric function $y = 7\sin\left(2x - \frac{\pi}{3}\right) - 6$.

(A) $\left[-\frac{\pi}{6},\ \frac{\pi}{6}\right]$
(B) $\left[-\frac{\pi}{3},\ \frac{\pi}{3}\right]$
(C) $[-1,\ 1]$
(D) $[-13,\ 1]$
(E) $[-1,\ 13]$

31. Angle A is in Quadrant II and $\cos A = -\frac{3}{5}$. Find $\tan A$.

(A) $\frac{3}{5}$
(B) $-\frac{3}{5}$
(C) $-\frac{4}{3}$
(D) $-\frac{3}{4}$
(E) $\frac{4}{5}$

32. Find the exact value of $\csc\left(\frac{5\pi}{3}\right)$.

(A) 2
(B) $\frac{2}{\sqrt{3}}$
(C) $-\frac{2}{\sqrt{3}}$
(D) $-\frac{1}{2}$
(E) -2

33. Find the principal cycle of $y=\cot\left(x-\frac{\pi}{4}\right)$.

(A) $-\frac{\pi}{4}<x<\frac{3\pi}{4}$
(B) $\frac{\pi}{4}<x<\frac{5\pi}{4}$
(C) $-\frac{\pi}{2}<x<\frac{\pi}{2}$
(D) $\frac{\pi}{2}<x<\frac{3\pi}{2}$
(E) $0<x<\pi$

34. Determine the equation of the sine function, which has amplitude 2 and period of 3.

(A) $y=2\sin(3x)$
(B) $y=2\sin\left(\frac{2\pi}{3}x\right)$
(C) $y=2\sin\left(\frac{4\pi}{3}x\right)$
(D) $y=3\sin(2x)$
(E) $y=3\sin(2\pi x)$

35. Find the general solution of the equation $\tan(3\alpha)=\sqrt{3}$.

(A) 0
(B) $\alpha=3k\pi$
(C) $\alpha=\frac{\pi}{3}+\frac{k\pi}{3}$
(D) $\alpha=\frac{\pi}{9}+\frac{k\pi}{3}$
(E) $\alpha=\frac{\pi}{9}+k\pi$

36. Which of the following expression equals to $\cos\left(\theta-\frac{\pi}{3}\right)$?

(A) $\dfrac{\sqrt{3}\cos\theta-\sin\theta}{2}$

(B) $\dfrac{\cos\theta-\sqrt{3}\sin\theta}{2}$

(C) $\dfrac{2\cos\theta+\sqrt{3}}{2}$

(D) $\dfrac{\sqrt{3}\cos\theta+\sin\theta}{2}$

(E) $\dfrac{\cos\theta+\sqrt{3}\sin\theta}{2}$

37. Find the value of $\cos(2\theta)$ if $\cos\theta=\dfrac{1}{\sqrt{3}}$.

(A) $\dfrac{\sqrt{2}}{3}$

(B) $-\dfrac{\sqrt{2}}{3}$

(C) 0

(D) $\dfrac{1}{3}$

(E) $-\dfrac{1}{3}$

38. Write $\cos\left(\cot^{-1}x\right)$ in an algebraic expression in terms of x.

(A) $\dfrac{x}{\sqrt{x^2-1}}$

(B) $\dfrac{x}{\sqrt{x^2+1}}$

(C) $\dfrac{x}{\sqrt{1-x^2}}$

(D) $\sqrt{x^2-1}$

(E) $\sqrt{x^2+1}$

39. Which of the following equals to $\cos 3\theta \cos\theta - \sin 3\theta \sin\theta$?

(A) $\sin 2\theta$
(B) $\sin 4\theta$
(C) $\sin 3\theta$
(D) $\cos 2\theta$
(E) $\cos 4\theta$

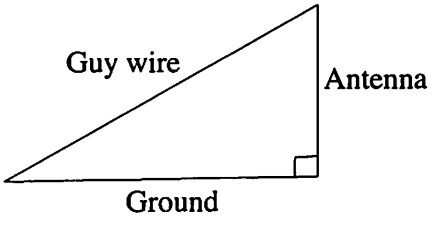
40. Which of the following equals to $\sin k + \dfrac{\cos^2 k}{\sin k}$?

(A) $\csc k$
(B) $\cot k$
(C) 1
(D) $\sec k$
(E) $\tan k$

41. Which of the following equations is NOT an identity?

(A) $\cos(2x) = 1 - 2\sin^2(x)$
(B) $\sin(x)\csc(x) = 1$
(C) $\sin(2x) = 2\sin^2(x) - 1$
(D) $\cot(x) = \dfrac{\cos(x)}{\sin(x)}$
(E) $\tan^2(x) = \sec^2(x) - 1$

42. A guy wire of length 108 meter runs from the top of a 70 meter antenna and to the ground. What angle does the guy wire make with the ground? See the figure below.

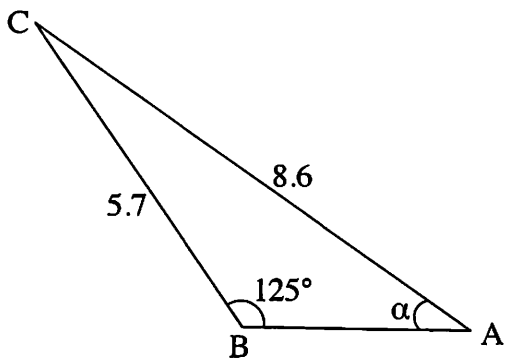


(A) 16.7°
(B) 27.5°
(C) 33.0°
(D) 40.4°
(E) 49.6°

43. You are at 300 ft from a tree. The angle of elevation to the top is 56°. How tall is the tree? Round your answer to the nearest feet.

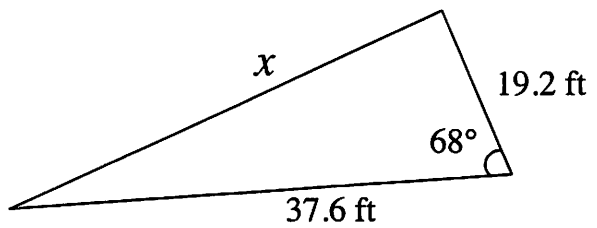
(A) 168 ft
(B) 183 ft
(C) 249 ft
(D) 356 ft
(E) 445 ft

44. Find the angle measure α in the triangle ABC where $AC = 8.6$, $BC = 5.7$, and $\angle ABC = 125°$. Round your answer to one decimal place.



(A) 13.8°
(B) 22.1°
(C) 32.9°
(D) 45.8°
(E) 68.6°

45. Find the value of x in the following triangle. Round your answer to one decimal place.



(A) 48.2 ft
(B) 35.2 ft
(C) 33.9 ft
(D) 26.3 ft
(E) 18.4 ft