MATH 1103 Common Final Exam
Multiple Choice Section
Fall 2011

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

This part of the exam consists of 35 multiple choice questions. They are printed on the front and the back of each page. Be sure that you answer 35 different questions. A special answer sheet is provided so that your answers can be machine graded.

- 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.*

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

1. A bank loaned out $\$100,000$, part of it at the flat rate of 10% per year and the rest at the flat rate 6% per year. If, after one year, the total interest received on both loans was $\$7,600$, how much was loaned at 10%? (Simple interest is paid once, at the end of the year.)

   (a) $20,000$ (b) $30,000$ (c) $40,000$ (d) $50,000$ (e) $60,000$

2. Find the domain of the function $f(x) = \dfrac{1}{\sqrt{20-2x}} - \dfrac{1}{\sqrt{x-5}}$.

   (a) $[5,10)$ (b) $(5,10)$ (c) $[5,20)$ (d) $(5,22)$ (e) $(-\infty,\infty)$

3. Which of the following lines is perpendicular to the line given by $2x+3y=5$?

   (a) $y=-\dfrac{2}{3}x-1$ (b) $y=\dfrac{2}{3}x-2$ (c) $y=-\dfrac{3}{2}x-3$ (d) $y=\dfrac{3}{2}x-4$ (e) $x=\dfrac{5}{2}$

4. Find the average rate of change for the function $f(x)=|x-1|$ between $x=-1$ and $x=1$.

   (a) 1 (b) $\dfrac{1}{2}$ (c) 0 (d) $-\dfrac{1}{2}$ (e) -1

5. Consider the piecewise defined function

$$f(x)=\begin{cases} -\dfrac{1}{x} & \text{if } x<0, \\ \dfrac{1}{x+1} & \text{if } x\geq 0. \end{cases}$$

   Evaluate $f(0)+f(1)$.

   (a) undefined (b) 0 (c) $\dfrac{1}{2}$ (d) 1 (e) $\dfrac{3}{2}$

6. If you translate the graph of $y=f(x)$ down 3 units and then apply a vertical compression by a factor of $\dfrac{2}{3}$, you get the graph of

   (a) $y=\dfrac{3}{2}f(x)-3$ (b) $y=\dfrac{2}{3}f(x)+3$ (c) $y=\dfrac{2}{3}f(x)+2$
   (d) $y=\dfrac{2}{3}f(x)-3$ (e) $y=\dfrac{2}{3}f(x)-2$

7. Match the function to the graph shown below:

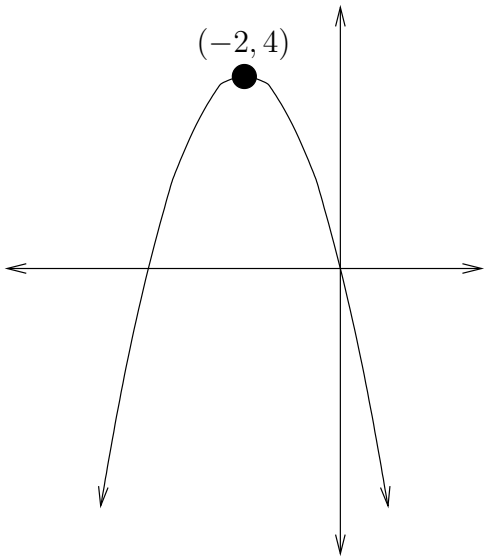
(a) $f(x) = (x-2)^2 + 4$

(b) $f(x) = -(x-2)^2 + 4$

(c) $f(x) = (x+2)^2 + 4$

(d) $f(x) = -(x+2)^2 + 4$

(e) $f(x) = -(x-2)^2 - 4$



8. The function $f(x) = x/(x^2-1)$ is

(a) even (b) odd (c) not defined at $x = 0$ (d) neither even, nor odd
(e) not a function (fails the vertical line test)

9. Find the inverse of $f(x) = 2x^3 + 1$.

(a) $\left(\frac{x-1}{2}\right)^3$ (b) $\frac{\sqrt[3]{x}-1}{2}$ (c) $\sqrt[3]{\frac{x+1}{2}}$ (d) $\sqrt[3]{\frac{x-1}{2}}$ (e) $\frac{\sqrt[3]{x-1}}{2}$

10. Solve the inequality $x^2 - 2x + 1 > 4$.

(a) $x < -1$ (b) $x > 2$ (c) $-2 < x < 2$ (d) $-1 < x < 3$ (e) $x < -1$ or $3 < x$

11. Find the composite function $f \circ g(x) = f(g(x))$, given $f(x) = \frac{1}{x+1}$ and $g(x) = \frac{1}{3x-1}$.

(a) $\frac{3x+1}{3x+2}$ (b) $\frac{3x+1}{3x-2}$ (c) $\frac{3x-1}{3x}$ (d) $\frac{x+1}{2-x}$ (e) $\frac{1}{3x}$

12. Consider the function $f(x) = x^2$ on the interval $[0, \infty)$. What is $f^{-1}(2)$?

(a) $-\sqrt{2}$ (b) 0 (c) $\sqrt{2}$ (d) $-\sqrt{2}$ or $\sqrt{2}$ (e) Not defined, f is not one to one.

13. Solve the equation $4^x - 18 \cdot 2^x + 32 = 0$. What is the difference of the two solutions?

    (a) 0 (b) 1 (c) 2 (d) 3 (e) 4

14. Find the equation of the axis of symmetry of the parabola $f(x) = 3x^2 + 30x - 11$.

    (a) $x = -11$ (b) $x = -10$ (c) $x = -5$ (d) $x = 5$ (e) $x = 10$

15. What is the largest rectangular area a farmer can enclose using 600 yards of fencing material?

    (a) 22,000 square feet (b) 22,500 square feet (c) 36,000 square feet (d) 40,000 square feet (e) 90,000 square feet

16. Using the rational zeros theorem, list all potential rational zeros of the equation $x^2 - 3 = 0$. **Do not solve the equation!**

    (a) $x = \pm\sqrt{3}$ (b) $x = \pm 3$ (c) $x = \pm 1$ (d) $x = \pm 1, \pm 3$ (e) No potential rational solution.

17. What remainder do you get when you divide $x^{100} + x - 2^{100}$ by $(x - 2)$?

    (a) 0 (b) 1 (c) 2 (d) 3 (e) 2^{100}

18. For what numbers of x in the interval $[-2\pi, 2\pi]$ does the graph of $y = \csc x$ have a vertical asymptote? (Angles are measured in radians.)

    (a) $-2, -1, 0, 1, 2$ (b) $-\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}$ (c) $-2\pi, \pi, 0, \pi, 2\pi$ (d) $-2\pi, 0, 2\pi$
    (e) No vertical asymptote.

19. List all values of x that must be excluded from the domain of the rational function $f(x) = \dfrac{x(x-1)}{(x+2)(x+3)}$.

    (a) $x \neq 0, 1, -2, -3$ (b) $x \neq 0, -1, 2, 3$ (c) $x \neq -2, -3$ (d) $x \neq 2, 3$ (e) $x \neq 0, 1$

20. Find *all* asymptotes (horizontal and vertical) of $f(x) = \dfrac{x-2}{x^2-4}$.

(a) $x = -2$ only (b) $x = 2$ and $x = -2$ (c) $x = 2$, $x = -2$ and $y = 0$
(d) $x = -2$ and $y = 0$ (e) $x = 2$ and $y = 1$

21. Solve the inequality $\dfrac{1}{x+1} \geq 1$.

(a) $(-1, 0]$ (b) $[-1, 0]$ (c) $(-\infty, -1] \cup [0, \infty)$ (d) $(-\infty, -1) \cup [0, \infty)$ (e) $(-\infty, -1) \cup (-1, \infty)$

22. Find the domain of $f(x) = \ln(x-1)$.

(a) all real numbers (b) $x < 1$ (c) $x \leq 1$ (d) $x > 1$ (e) $x \geq 1$

23. Use the base-change formula to find $\log_2(7)$. Round your answer to the nearest decimal digit.

(a) 2.5 (b) 2.6 (c) 2.7 (d) 2.8 (e) 2.9

24. Convert the equation $4^{-2} = \dfrac{1}{16}$ to *logarithmic form*.

(a) $\log_{-2}(4) = \dfrac{1}{16}$ (b) $\log_{-2}\left(\frac{1}{16}\right) = 4$ (c) $\log_4(-2) = \dfrac{1}{16}$ (d) $\log_4\left(\frac{1}{16}\right) = -2$
(e) $\log_{\frac{1}{16}}(4) = -2$

25. Write $\ln(x) + \frac{2}{3}\ln(y) - 2\ln(z)$ as a single logarithm.

(a) $\ln\left(\dfrac{x\sqrt[3]{2y}}{z^2}\right)$ (b) $\ln\left(\dfrac{x\sqrt{y^3}}{z^2}\right)$ (c) $\ln\left(\dfrac{x\sqrt[3]{y^2}}{z^2}\right)$ (d) $\ln(x\sqrt[3]{y^2}z^2)$ (e) $\ln\left(\dfrac{2xy/3}{2z}\right)$

26. Solve the equation $3^{3x+1} = 9^x$.

(a) $x = -2$ (b) $x = -1$ (c) $x = 0$ (d) $x = 1$ (e) $x = 2$

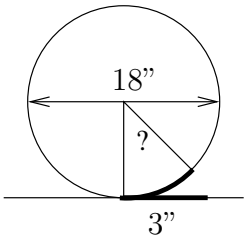
27. Find the amount in 20 years if a principal $P = 5,000$ is invested at the nominal rate of $r = 5\%$, compounded quarterly. Round your answer to the nearest dollar.

(a) 13,590 (b) 13,563 (c) 13,507 (d) 13,480 (e) 13,425

28. A new flu virus starts spreading across a town whose population is $300,000$ people. The number of people infected is $f(t) = 5 \cdot e^{0.3t}$ where t is measured in days. If no measures are taken, after how many days will everybody be infected in the town?

    (a) 22 days (b) 27 days (c) 32 days (d) 37 days (e) 42 days

29. The wheel of a truck has 18 inch diameter. How much does the wheel turn while the truck travels 3 inches? Express your answer in radians.



    (a) 1/6 (b) 1/4 (c) 1/3 (d) 1/2 (e) 1

30. Find the *exact* value of $\cos^2(15^o) - \sin^2(15^o)$.

    (a) 0.5 (b) $\frac{\sqrt{3}}{2}$ (c) 0.866 (d) -0.5 (e) $\frac{1}{\sqrt{2}}$

31. Determine the amplitude and period of $f(x) = (-3) \cdot \sin\left(\frac{\pi \cdot x}{6}\right)$. (Angles are measured in radians.)

    (a) Amplitude: 3 Period: 12 (b) Amplitude: -3 Period: 12
    (c) Amplitude: 6 Period: 3 (d) Amplitude: 3 Period: 6
    (e) Amplitude: 1/3 Period: 12π

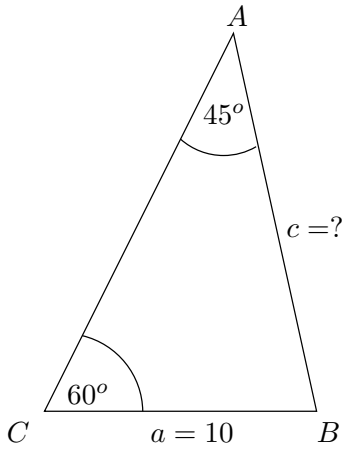
32. Solve the equation $\tan(x) = 1$ on the interval $x \in [-\pi/2, \pi/2]$. (Angles are measured in radians.)

    (a) $x = \pi/4$ only (b) $x = \pi/4$ or $x = -\pi/4$ (c) $x = \pi/3$ or $x = -\pi/3$ (d) $x = \pi/3$ only (e) $x = 0$

33. Use trigonometric identities to find the exact value of $\cos(\pi)\cos(3\pi/4) + \sin(\pi)\sin(3\pi/4)$. (Angles are measured in radians.)

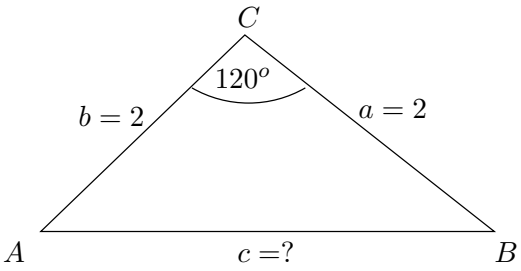
    (a) $\frac{\sqrt{3}}{2}$ (b) $-\frac{\sqrt{3}}{2}$ (c) $\frac{\sqrt{2}}{2}$ (d) $-\frac{\sqrt{2}}{2}$ (e) $\frac{1}{2}$

34. Use the law of sines to find the missing side c in the picture.



(a) $\frac{\sqrt{3}}{20\sqrt{2}}$ (b) $\frac{10\sqrt{2}}{\sqrt{3}}$ (c) $\frac{5\sqrt{6}}{2}$ (d) $5\sqrt{6}$ (e) $\frac{5\sqrt{2}}{2}$

35. Use the law of cosines to find the missing side c in the picture.



(a) $\sqrt{8+4\sqrt{3}}$ (b) 2 (c) 4 (d) $\sqrt{3}$ (e) $2\sqrt{3}$