MATH 41 NAME _

FINAL EXAM STUDENT NUMBER _____

DECEMBER, 2005 INSTRUCTOR _____

FORM A SECTION NUMBER _____

This examination will be machine processed by the University Testing Service. Use only a number 2 pencil on your answer sheet. On your answer sheet identify your name, this course (Math 41) and the date. Code and blacken the corresponding circles on your answer sheet for your student I.D. number and class section number. Code in your test form.

There are 30 multiple choice questions each worth five points. For each problem **five** possible answers are given, only one of which is correct. You should solve the problem, note the letter of the answer that you wish to give and **blacken** the corresponding space on the **answer sheet**. Mark only one choice; darken the circle completely (you should not be able to see the letter after you have darkened the circle). Check frequently to be sure the problem number on the test sheet is the same as the problem number of the answer sheet.

**THE USE OF A CALCULATOR, CELL PHONE, OR ANY OTHER ELECTRONIC DEVICE IS NOT PERMITTED DURING THIS EXAMINATION.**

**CHECK THE EXAMINATION BOOKLET BEFORE YOU START. THERE SHOULD BE 30 PROBLEMS ON 16 PAGES (INCLUDING THIS ONE).**

1. Solve $3x^2 + 3x - 4 = 0$.

   a) $x = \dfrac{3 \pm \sqrt{33}}{4}$

   b) $x = \dfrac{-3 \pm \sqrt{57}}{8}$

   c) $x = \dfrac{-3 \pm \sqrt{57}}{6}$

   d) $x = \dfrac{3 \pm \sqrt{57}}{8}$

   e) $x = \dfrac{3 \pm \sqrt{57}}{6}$

2. Find the slope of the line that passes through the points $(-5, -4)$ and $(6, -3)$.

   a) $\dfrac{1}{10}$

   b) $\dfrac{1}{11}$

   c) $\dfrac{1}{8}$

   d) $\dfrac{1}{9}$

   e) $\dfrac{1}{13}$

3. Find the center of the circle $x^2 + y^2 + 8x - 2y = -16$.

   a) $(-8, 2)$

   b) $(-4, 1)$

   c) $(4, 1)$

   d) $(4, -1)$

   e) $(-4, -1)$

4. Determine the number of real roots of the equation $x^2 - 10x + 17 = 0$.

   a) The equation has no real roots.

   b) The equation has exactly two real roots.

   c) The equation has exactly one real root.

   d) The equation has exactly three real roots.

   e) The equation has exactly four real roots.

5. Find all solutions for $4|x-2| = 3x-4$.

a) $x = 2, \dfrac{1}{2}$

b) $x = 3, \dfrac{5}{4}$

c) $x = 1, \dfrac{1}{8}$

d) $x = 4, \dfrac{12}{7}$

e) no solution

6. Solve $\left|\dfrac{x-4}{4}\right| < 4$.

a) $[-12, 20]$

b) $(-12, 20)$

c) $(-12, \infty)$

d) $(-\infty, -12) \cup (20, \infty)$

e) $(-\infty, -12] \cup [20, \infty)$

7. Solve the inequality $x^2 + 2x - 3 < 0$.

a) $[-3, 1]$

b) $(-\infty, -3) \cup (1, \infty)$

c) $(-1, 3)$

d) $(-3, 1)$

e) no solution

8. Find the domain of $h(x) = \sqrt{x^2 - 49}$.

a) $(-\infty, -7) \cup (7, \infty)$

b) $(-7, 7)$

c) $(-\infty, 49] \cup [49, \infty)$

d) $(-\infty, -7] \cup [7, \infty)$

e) $(7, \infty)$

9. Find the difference quotient $\dfrac{f(x+h) - f(x)}{h}$ for the function $f(x) = 9x - 1$.

a) $9 - h$

b) $9 + h$

c) $-h$

d) $-9$

e) $9$

10. Let $f(x) = 5x - 2$. Find $f^{-1}(x)$.

a) $f^{-1}(x) = \dfrac{x}{5} + 2$

b) $f^{-1}(x) = \dfrac{x+2}{5}$

c) $f^{-1}(x) = \dfrac{x-2}{8}$

d) $f^{-1}(x) = \dfrac{1}{5x-2}$

e) $f^{-1}(x) = \dfrac{x-5}{2}$

11. Two points $A$ and $B$ move along the $x-$axis. After $t$ seconds, their positions are given by the equations

$$A: \quad x = 6t + 120$$
$$B: \quad x = 30t - 72$$

At what time $t$ do $A$ and $B$ have the same $x$-coordinate?

a) 8 sec

b) 9 sec

c) 7 sec

d) 6 sec

e) 30 sec

12. How far from the origin is the vertex of the parabola $y = x^2 - 6x + 5$?

a) 9 units

b) 5 units

c) 2 units

d) 8 units

e) 6 units

13. The area of a rectangle is 95 cm$^2$. Express the perimeter of the rectangle as a function of the width $x$.

a) $P(x) = 2x + \dfrac{190}{x}$

b) $P(x) = 2\left(2x + \dfrac{95}{x}\right)$

c) $P(x) = 19x + x^2$

d) $P(x) = x - \dfrac{95}{x}$

e) $P(x) = x - \dfrac{190}{x}$

14. The difference of two numbers is 4. What is the smallest possible value for the sum of their squares?

a) 16

b) 8

c) 10

d) 7

e) 26

15. Specify the vertical asymptotes and horizontal asymptotes for the rational function $y = \dfrac{x^2 - 4}{9x^2 - 1}$.

a) vertical asymptotes: $x = -\dfrac{1}{3}, x = \dfrac{1}{3}$ and horizontal asymptote: $y = \dfrac{1}{9}$

b) no vertical asymptotes and horizontal asymptote: $y = -\dfrac{1}{9}$

c) no vertical asymptotes and horizontal asymptote: $y = \dfrac{1}{9}$

d) vertical asymptote: $x = -2$ and horizontal asymptote: $y = 0$

e) vertical asymptotes: $x = -\dfrac{1}{3}, x = \dfrac{1}{3}$ and horizontal asymptote: $y = -\dfrac{1}{9}$

16. Solve $9x^2(5^x) - 25(5^x) = 0$ for $x$.

a) $\dfrac{5}{3}$

b) $0, -1, 5$

c) $0, \dfrac{3}{5}$

d) $\dfrac{5}{3}, -\dfrac{5}{3}$

e) no solution

17. Which of the following properties apply to the function $y = x^7$?

a) The function is not one-to-one.

b) The function is decreasing for $-\infty < x < 0$.

c) The graph has an asymptote.

d) The domain of the function is $(-\infty, \infty)$.

e) The function is decreasing for $0 < x < \infty$.

18. Write $\dfrac{1}{343} = 7^{-3}$ in logarithmic form.

a) $\log_7 \dfrac{1}{343} = 3$

b) $\log_7 \dfrac{1}{7} = 343$

c) $\log_7 343 = -3$

d) $\log_7 \dfrac{1}{343} = -3$

e) $\log_{343} \dfrac{1}{7} = -3$

19. Simplify $\ln e^8 - \ln e^5$.

a) $\dfrac{1}{e}$

b) $\dfrac{e^5}{e^8}$

c) 3

d) $e^3$

e) 13

20. Find all the real roots of the equation $\log_{63} x + \log_{63}(x + 2) = 1$.

a) $x = 7, x = -9$

b) $x = -7, x = 9$

c) $x = -9$

d) $x = 9$

e) $x = 7$

21. Evaluate $\tan 390°$.

a) $-\dfrac{\sqrt{5}}{5}$

b) $-\dfrac{\sqrt{5}}{3}$

c) $-\dfrac{\sqrt{3}}{3}$

d) $\dfrac{1}{5}$

e) $\dfrac{\sqrt{3}}{3}$

22. The expression $(1 - \sin\theta)(\sec\theta + \tan\theta)$ is equal to

a) 1.

b) $\cos\theta$.

c) $\csc\theta$.

d) $\sin\theta$.

e) $\sec\theta$.

23. In a circle of radius 3 cm, the area of a certain sector is $\frac{8\pi}{7}$ cm$^2$. Find the radian measure of the central angle.

a) $\frac{63\pi}{16}$

b) $63\pi$

c) $\frac{16\pi}{63}$

d) $1008\pi$

e) $16\pi$

24. Simplify $\frac{\csc^2\theta - \cot^2\theta}{1 + \cot^2\theta}$.

a) $\csc^2\theta$

b) $\cos^2\theta$

c) $\sec^2\theta$

d) 1

e) $\sin^2\theta$

25. Consider the function $y = \cos\frac{x}{6}$ on the interval $[0, 12\pi]$. Specify the interval in which the function is increasing.

a) $(8\pi, 10\pi)$

b) $(0, 8\pi)$

c) $\left(\frac{\pi}{12}, \frac{\pi}{6}\right)$

d) $(6\pi, 12\pi)$

e) $(0, 6\pi)$

26. Simplify $\sin\left(\frac{\pi}{3} + s\right) - \sin\left(\frac{\pi}{3} - s\right)$.

a) $\frac{\sqrt{3}}{2}\sin s$

b) $\frac{\sqrt{2}}{2}\sin s$

c) $\sin s$

d) $\frac{1}{2}\sin s$

e) $2\sin s$

27. Simplify $\frac{\sin 2\theta}{\cos\theta} + \frac{\cos 2\theta}{\sin\theta}$.

a) $\cos\theta$

b) $\cot\theta$

c) $\sin\theta$

d) $\csc\theta$

e) $\sec\theta$

28. Evaluate $\arctan(\sqrt{3})$.

a) $-\frac{\pi}{6}$

b) $-\frac{\pi}{3}$

c) $\frac{\pi}{12}$

d) $\frac{\pi}{3}$

e) $\frac{\pi}{4}$

29. Evaluate $\tan\left[\sin^{-1}\left(\frac{15}{17}\right)\right]$.

a) $\frac{15}{8}$

b) $\frac{8}{17}$

c) $\frac{17}{8}$

d) $\frac{17}{15}$

e) $\frac{15}{17}$

30. In a triangle $ABC$, if $\angle A = 60°, \angle B = 45°$ and $BC = 13$ cm, find $AC$.

a) $AC = 26\dfrac{\sqrt{3}}{3}$

b) $AC = 13\dfrac{\sqrt{6}}{2}$

c) $AC = 13\dfrac{\sqrt{3}}{2}$

d) $AC = 13\dfrac{\sqrt{6}}{3}$

e) $AC = 13\dfrac{\sqrt{6}}{4}$