MAT 098 Final Exam A Answer Sheet

Fall 2011

Circle and blacken your answer choice. If you make a mistake, place an X on the one you do not wish to choose.

Keep your eyes on your own paper! You may not share a calculator. You must put all cell phones and electronic devices away during the exam. Only a traditional or graphing calculator may be used. Notes stored in the calculator memory are prohibited on this exam.

1. 13 A B C D
   14 A B C D
   15 A B C D
   16 A B C D
   17 A B C D

2. 18 A B C D
   19 A B C D
   20 A B C D
   21 A B C D
   22 A B C D

3. 23 A B C D
   24 A B C D
   25 A B C D
   26 A B C D
   27 A B C D

4. 28 A B C D
   29 A B C D
   30 A B C D
   31 A B C D
   32 A B C D

5. 33 A B C D
   34 A B C D
Formulas:

\[ C = 2\pi r = \pi d \]
\[ P = 2l + 2w \]
\[ A = lw \quad A = s^2 \]
\[ A = \pi r^2 \]
\[ A = \frac{1}{2} bh \quad A = bh \]
\[ A = \frac{1}{2} h(b_1 + b_2) \]
\[ V = s^3 \quad V = lwh \]
\[ V = \pi r^2 h \]
\[ V = \frac{1}{3} \pi r^2 h \quad V = \frac{4}{3} \pi r^3 \]
\[ V = \frac{1}{3} Bh \]
\[ rt = d \]
\[ \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \]
\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]
\[ y = mx + b \]
\[ y - y_1 = m(x - x_1) \]
\[ a^3 + b^3 = (a + b)(a^2 - ab + b^2) \]
\[ a^3 - b^3 = (a - b)(a^2 + ab + b^2) \]
\[ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]
\[ a^2 + b^2 = c^2 \]
\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]
\[ \left( \frac{-b}{2a}, f\left( \frac{-b}{2a} \right) \right) \]
Write an equation of the line with the given slope and containing the given point. Write the equation in the form \( y = mx + b \).

1) Slope 3; through (-3, 8)

Factor the polynomial completely.

2) \( 5x^2 + 7x - 6 \)

Use the quadratic formula to solve the equation.

3) \( x^2 + 6x + 25 = 0 \)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Add or subtract. Assume all variables represent positive real numbers.

4) \( -4\sqrt{2} - 8\sqrt{50} \)
   A) \(-36\sqrt{2}\)  B) \(44\sqrt{2}\)  C) \(-12\sqrt{2}\)  D) \(-44\sqrt{2}\)

Divide.

5) \( \frac{6x^8 - 12x^5}{3x^2} \)
   A) \(2x^6 - 12x^5\)  B) \(-2x^11\)  C) \(2x^6 - 4x^3\)  D) \(6x^8 - 4x^3\)

Rationalize the denominator and simplify. Assume that all variables represent positive real numbers.

6) \( \frac{1}{\sqrt{5}} \)
   A) \(\sqrt{5}\)  B) \(\frac{\sqrt{5}}{25}\)  C) 1  D) \(\frac{\sqrt{5}}{5}\)

Factor the polynomial completely.

7) \( xy + 8x - 4y - 32 \)
   A) \((x - 8)(y + 4)\)  B) \((x + 8)(y - 4)\)  C) \((y - 8)(x + 4)\)  D) \((y + 8)(x - 4)\)

Solve the system of equations.

8) \[
\begin{align*}
\begin{cases}
x - 2y &= 3 \\
-6x - 3y &= -63
\end{cases}
\end{align*}
\]
   A) \((-9, 4)\)  B) \((9, 3)\)  C) \((8, 4)\)  D) \(\varnothing\)

Write with positive exponents. Simplify if possible.

9) \(16^{-3/2} \)
   A) \(-\frac{1}{64}\)  B) 64  C) \(-64\)  D) \(\frac{1}{64}\)
Solve the equation.

10) \( \frac{19}{x} = 4 - \frac{1}{x} \)
   A) \( \frac{19}{4} \)  B) 5  C) 4  D) \( \frac{2}{9} \)  

Simplify the radical expression. Assume that all variables represent positive real numbers.

11) \( \sqrt[12]{54x^2y} \)
   A) \( 3x\sqrt[12]{6y} \)  B) \( 3x^2\sqrt[12]{6y} \)  C) \( 3xy\sqrt[6]{6} \)  D) \( 3xy^2\sqrt[6]{6} \)  

Determine the coordinates of the indicated point on the graph.

12) B
   A) (4, -3)  B) (4, 3)  C) (3, 4)  D) (-3, 4)  

Simplify the expression.

13) \( 9x - 4(6 - x) + 28 \)
   A) \( 13x + 4 \)  B) \( 8x + 4 \)  C) \( 13x + 52 \)  D) \( 5x + 52 \)  

Perform the indicated operation. Write the result in the form \( a + bi \).

14) \( 2 - 2i + (6 + 9i) \)
   A) \( 8 + 7i \)  B) \( -8 - 7i \)  C) \( 8 - 7i \)  D) \( -4 + 11i \)  

Use the square root property to solve the equation.

15) \( (x - 6)^2 = 4 \)
   A) 8, 4  B) 10  C) 4, -8  D) 2, -2  

Solve the equation for the specified variable.

16) \( F = \frac{-GMm}{r^2} \) for \( M \)
   A) \( M = \frac{-FGm}{r^2} \)  B) \( M = \frac{-Fr^2}{Gm} \)  C) \( M = \frac{Fr^2}{Gm} \)  D) \( M = -Fr^2 - Gm \)  

Find the slope of the line that goes through the given points.

17) (3, -5), (-3, 6)
   A) \( -\frac{6}{11} \)  B) \( \frac{6}{11} \)  C) \( \frac{11}{6} \)  D) \( -\frac{11}{6} \)
Write the solution set using interval notation.
18) \(-9 - 3x \leq 9\)
   A) \((-\infty, -6)\) \hspace{1cm} B) \((-\infty, 6)\) \hspace{1cm} C) \([6, \infty)\) \hspace{1cm} D) \([-6, \infty)\)  

Write the number in scientific notation.
19) In a certain city, the bus system carried a total of 12,700,000,000 passengers.
   A) \(1.27 \times 10^{10}\) \hspace{1cm} B) \(1.27 \times 10^{11}\) \hspace{1cm} C) \(12.7 \times 10^{10}\) \hspace{1cm} D) \(1.27 \times 10^{9}\)  

Solve the compound inequality. Graph the solution set.
20) \(9 \leq 3t - 3 \leq 18\)
   A) \([4, 7]\) \hspace{1cm} B) \((-7, -4]\) \hspace{1cm} C) \([-7, -4]\) \hspace{1cm} D) \((4, 7]\)  

Solve the absolute value equation.
21) \(|3x + 8| + 5 = 9\)
   A) \(-\frac{1}{2}, -\frac{3}{2}\) \hspace{1cm} B) \(\frac{4}{3}, 4\) \hspace{1cm} C) \(-\frac{4}{3}, -4\) \hspace{1cm} D) \(\emptyset\)  

Perform the indicated operation. Simplify if possible.
22) \(\frac{3}{r} + \frac{8}{r - 5}\)
   A) \(\frac{15r - 11}{r(r - 5)}\) \hspace{1cm} B) \(\frac{11r - 15}{r(r - 5)}\) \hspace{1cm} C) \(\frac{15r - 11}{r(5 - r)}\) \hspace{1cm} D) \(\frac{11r - 15}{r(5 - r)}\)  

Write the phrase as a variable expression. Use \(x\) to represent "a number."
23) The quotient of 60 and a number
   A) \(\frac{60}{x}\) \hspace{1cm} B) \(\frac{x}{60}\) \hspace{1cm} C) \(60 - x\) \hspace{1cm} D) \(x - 60\)  

Multiply.
24) \((2x - 3)^2\)
   A) \(4x^2 - 12x + 9\) \hspace{1cm} B) \(4x^2 + 9\) \hspace{1cm} C) \(2x^2 - 12x + 9\) \hspace{1cm} D) \(2x^2 + 9\)
Graph the inequality.
25) \( x + y \leq -2 \)

Multiply or divide as indicated. Simplify completely.
26) \( \frac{5xy^5}{4x^7y^3} \cdot \frac{-20x^6y^6}{15x^8y^{10}} \)

A) \( -\frac{15y^6}{16x^4} \)  
B) \( -\frac{5}{3x^7y^3} \)  
C) \( -\frac{5}{3x^9y^2} \)  
D) \( -\frac{5}{3x^8y^2} \)
Factor the polynomial completely.

27) \(9x^2 - 49\)
   A) \((3x - 7)^2\)  
   B) \((3x + 7)(3x - 7)\)  
   C) \((3x + 7)^2\)  
   D) prime polynomial

Find the indicated value.

28) Use the graph to find \(f(1)\).

![Graph with points and line]

   A) 9  
   B) -9  
   C) -10  
   D) -8

Solve the equation.

29) \(\frac{4}{3} + \frac{x}{4} = \frac{17}{12}\)
   A) \(\frac{1}{3}\)  
   B) \(-\frac{1}{3}\)  
   C) \(-\frac{1}{4}\)  
   D) \(\frac{1}{4}\)

Find the value of the algebraic expression at the given replacement value.

30) \(\frac{y - 7x}{2x + xy}\) when \(x = -2, y = 3\)
   A) \(\frac{11}{10}\)  
   B) \(-\frac{11}{2}\)  
   C) \(-\frac{9}{5}\)  
   D) \(-\frac{17}{10}\)

Solve.

31) An arrow is fired into the air with an initial velocity of 64 feet per second. The height in feet of the arrow \(t\) seconds after it was shot into the air is given by the function \(h(t) = -16t^2 + 64t\). Find the maximum height of the arrow.
   A) 64 ft  
   B) 32 ft  
   C) 192 ft  
   D) 96 ft

32) Three bacteria are placed in a petri dish. The population will triple every day. The formula for the number of bacteria in the dish on day \(t\) is
   
   \[N(t) = 3(3)^t\]
   
   where \(t\) is the number of days after the three bacteria are placed in the dish. How many bacteria are in the dish eight days after the three bacteria are placed in the dish?
   A) 19,683  
   B) 1536  
   C) 14  
   D) 72
33) Find the distance between the pair of points. 
   (6, -1) and (3, -7)
   A) 27 units          B) $3\sqrt{3}$ units          C) $27\sqrt{3}$ units          D) 3 units

34) Solve the inequality. Graph the solution set.
   $|x| \geq 3$

   A) $(-\infty, -3) \cup (3, \infty)$
   B) $[-3, 3]$  
   C) $[3, \infty)$
   D) $(-\infty, -3] \cup [3, \infty)$
Circle and blacken your answer choice. If you make a mistake, place an X on the one you do not wish to choose.

Keep your eyes on your own paper! You may not share a calculator. You must put all cell phones and electronic devices away during the exam. Only a traditional or graphing calculator may be used. Notes stored in the calculator memory are prohibited on this exam.

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28. A B C D
29. A B C D
30. A B C D
31. A B C D
32. A B C D
33. A B C D
34. A B C D
Formulas:

\[ C = 2 \pi r = \pi d \]
\[ P = 2l + 2w \]
\[ A = lw \quad A = s^2 \]
\[ A = \pi r^2 \]
\[ A = \frac{1}{2} bh \quad A = bh \]
\[ A = \frac{1}{2} h(b_1 + b_2) \]
\[ V = s^3 \quad V = lwh \]
\[ V = \pi r^2 h \]
\[ V = \frac{1}{3} \pi r^2 h \quad V = \frac{4}{3} \pi r^3 \]
\[ V = \frac{1}{3} Bh \]
\[ rt = d \]
\[ \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \]
\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]
\[ y = mx + b \]
\[ y - y_1 = m(x - x_1) \]
\[ a^3 + b^3 = (a + b)(a^2 - ab + b^2) \]
\[ a^3 - b^3 = (a - b)(a^2 + ab + b^2) \]
\[ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]
\[ a^2 + b^2 = c^2 \]
\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]
\[ \left( \frac{-b}{2a}, f\left(\frac{-b}{2a}\right) \right) \]
MAT 098 Final Exam
Name________________________________________________________

SHORT ANSWER. Solve the following. Include your work and the answer on the answer page of the final exam to earn full credit on these problems.

Write an equation of the line with the given slope and containing the given point. Write the equation in the form $y = mx + b$.

1) Slope $-3$; through $(-5, 3)$

Factor the polynomial completely.

2) $5x^2 + 7x - 24$

Use the quadratic formula to solve the equation.

3) $x^2 + 14x + 74 = 0$

MULTIPLE Choice. Choose the one alternative that best completes the statement or answers the question.

Add or subtract. Assume all variables represent positive real numbers.

4) $-6\sqrt{7} - 8\sqrt{28}$
   A) $22\sqrt{7}$
   B) $-10\sqrt{7}$
   C) $-14\sqrt{7}$
   D) $-22\sqrt{7}$

Divide.

5) $\frac{-12x^{10} + 18x^7}{-3x^4}$
   A) $4x^6 - 6x^3$
   B) $-12x^{10} - 6x^3$
   C) $4x^6 + 18x^7$
   D) $-2x^{13}$

Rationalize the denominator and simplify. Assume that all variables represent positive real numbers.

6) $\sqrt{\frac{1}{6}}$
   A) $\frac{\sqrt{6}}{6}$
   B) $\frac{\sqrt{6}}{36}$
   C) 1
   D) $\sqrt{6}$

Factor the polynomial completely.

7) $xy + 12x - 2y - 24$
   A) $(x + 12)(y - 2)$
   B) $(y - 12)(x + 2)$
   C) $(x - 12)(y + 2)$
   D) $(y + 12)(x - 2)$

Solve the system of equations.

8)
   \[
   \begin{align*}
   x + 8y &= 30 \\
   -3x + 7y &= 34
   \end{align*}
   \]
   A) (-3, 5)
   B) (2, 5)
   C) (-2, 4)
   D) $\varnothing$

Write with positive exponents. Simplify if possible.

9) $49^{-3/2}$
   A) 343
   B) $\frac{1}{343}$
   C) -343
   D) $-\frac{1}{343}$
Solve the equation.
10) \( \frac{8}{x} = 3 - \frac{1}{x} \)
   A) 3  B) 2  C) \( \frac{8}{3} \)  D) \( \frac{3}{7} \)

Simplify the radical expression. Assume that all variables represent positive real numbers.
11) \( \sqrt{45x^2y} \)
   A) \( 3xy^2\sqrt{5} \)  B) \( 3x\sqrt{5y} \)  C) \( 3x^2\sqrt{5y} \)  D) \( 3xy\sqrt{5} \)

Determine the coordinates of the indicated point on the graph.
12) B
   A) (3, 4)  B) (-3, 4)  C) (4, 3)  D) (4, -3)

Simplify the expression.
13) \( 7x + 2(6 + x) + 27 \)
   A) \( 5x + 15 \)  B) \( 8x + 39 \)  C) \( 9x + 15 \)  D) \( 9x + 39 \)

Perform the indicated operation. Write the result in the form \( a + bi \).
14) \((5 - 2i) + (6 + 6i)\)
   A) \( 11 + 4i \)  B) \(-11 - 4i \)  C) \(-1 + 8i \)  D) \( 11 - 4i \)

Use the square root property to solve the equation.
15) \((x - 7)^2 = 9\)
   A) 3, -3  B) 16  C) 10, 4  D) 4, -10

Solve the equation for the specified variable.
16) \( F = \frac{-GMm}{r^2} \) for \( m \)
   A) \( m = -Fr^2 - GM \)  B) \( m = \frac{-F}{GM} \)  C) \( m = \frac{Fr^2}{GM} \)  D) \( m = -\frac{F}{GM} \)

Find the slope of the line that goes through the given points.
17) \((5, -9), (-9, 8)\)
   A) \( \frac{14}{17} \)  B) \( -\frac{14}{17} \)  C) \( \frac{17}{14} \)  D) \( -\frac{17}{14} \)
Write the solution set using interval notation.
18) \(-25 - 5x \leq 10\)
   A) \((-\infty, -7)\)    B) \([7, \infty)\)    C) \([-7, \infty)\)    D) \((-\infty, 7)\)

Write the number in scientific notation.
19) In a certain city, the bus system carried a total of 15,100,000,000 passengers.
   A) \(1.51 \times 10^{11}\)    B) \(1.51 \times 10^{10}\)    C) \(1.51 \times 10^{9}\)    D) \(1.51 \times 10^{10}\)

Solve the compound inequality. Graph the solution set.
20) \(11 \leq 3t + 2 \leq 20\)
   A) \([-6, -3]\)
   B) \((3, 6]\)
   C) \((-6, -3)\)
   D) \([3, 6]\)

Solve the absolute value equation.
21) \(|8x + 7| + 9 = 15\)
   A) \(\frac{1}{8}, \frac{13}{8}\)    B) \(-\frac{1}{7}, -\frac{13}{7}\)    C) \(-\frac{1}{8}, -\frac{13}{8}\)    D) \(\emptyset\)

Perform the indicated operation. Simplify if possible.
22) \(\frac{5}{r} + \frac{7}{r - 3}\)
   A) \(\frac{12r - 15}{r(3 - r)}\)    B) \(\frac{12r - 15}{r(r - 3)}\)    C) \(\frac{15r - 12}{r(r - 3)}\)    D) \(\frac{15r - 12}{r(3 - r)}\)

Write the phrase as a variable expression. Use \(x\) to represent "a number."
23) The quotient of 61 and a number
   A) \(61 - x\)    B) \(\frac{x}{61}\)    C) \(\frac{61}{x}\)    D) \(x - 61\)

Multiply.
24) \((3x - 8)^2\)
   A) \(9x^2 + 64\)    B) \(3x^2 + 64\)    C) \(3x^2 - 48x + 64\)    D) \(9x^2 - 48x + 64\)
Graph the inequality.

25) \( x + y \leq -4 \)

Multiply or divide as indicated. Simplify completely.

26) \( \frac{5xy^5}{4x^7y^3} \cdot \frac{-20x^6y^6}{15x^8y^{10}} \)

A) \( \frac{-15y^6}{16x^4} \)  
B) \( \frac{5}{3x^8y^2} \)  
C) \( \frac{5}{3x^7y^3} \)  
D) \( \frac{-5}{3x^9y^2} \)
Factor the polynomial completely.
27) $36x^2 - 25$
   A) $(6x - 5)^2$
   B) $(6x + 5)^2$
   C) $(6x + 5)(6x - 5)$
   D) prime polynomial

Find the indicated value.
28) Use the graph to find $f(-9)$.

![Graph with a parabola showing points and an arrow indicating the value of $f(-9)$]

A) $-5$
B) 4
C) $-4$
D) $-3$

Solve the equation.
29) $\frac{4}{3} \cdot \frac{x}{5} = \frac{4}{15}$
A) $-\frac{16}{5}$
B) $\frac{16}{5}$
C) $\frac{16}{3}$
D) $-\frac{16}{3}$

Find the value of the algebraic expression at the given replacement value.
30) $\frac{y - 4x}{7x + xy}$ when $x = -2, y = 3$
A) $\frac{5}{8}$
B) $-\frac{9}{20}$
C) $\frac{1}{4}$
D) $-\frac{11}{20}$

Solve.
31) An arrow is fired into the air with an initial velocity of 160 feet per second. The height in feet of the arrow $t$ seconds after it was shot into the air is given by the function $h(t) = -16t^2 + 160t$. Find the maximum height of the arrow.
A) 720 ft
B) 1200 ft
C) 400 ft
D) 80 ft

32) Three bacteria are placed in a petri dish. The population will triple every day. The formula for the number of bacteria in the dish on day $t$ is

$$N(t) = 3(3)^t$$

where $t$ is the number of days after the three bacteria are placed in the dish. How many bacteria are in the dish six days after the three bacteria are placed in the dish?
A) 54
B) 12
C) 2187
D) 648
Find the distance between the pair of points.
33) (6, -4) and (2, -2)
   A) $2\sqrt{5}$ units        B) $12\sqrt{3}$ units        C) 12 units        D) 6 units

Solve the inequality. Graph the solution set.
34) $|x| \geq 2$

A) $[2, \infty)$

B) $(-\infty, -2) \cup (2, \infty)$

C) $(-\infty, -2] \cup [2, \infty)$

D) $[-2, 2]$
Answer Key
Testname: F11 098 DEPT FINAL

1) $y = 3x + 17$
2) $(x + 2)(5x - 3)$
3) $-3 - 4i, -3 + 4i$
4) D
5) C
6) D
7) D
8) B
9) D
10) B
11) A
12) D
13) A
14) A
15) A
16) B
17) D
18) D
19) A
20) A
21) C
22) B
23) A
24) A
25) B
26) D
27) B
28) B
29) A
30) D
31) A
32) A
33) B
34) D
1) $y = -3x - 12$
2) $(x + 3)(5x - 8)$
3) $-7 - 5i, -7 + 5i$
4) D
5) A
6) A
7) D
8) C
9) B
10) A
11) B
12) B
13) D
14) A
15) C
16) D
17) D
18) C
19) D
20) D
21) C
22) B
23) C
24) D
25) B
26) B
27) C
28) C
29) C
30) D
31) C
32) C
33) A
34) C