A. Sign and date your scantron on the back at the bottom.

B. In pencil, write and encode in the spaces indicated on your scantron:

1) Name (last name, first initial, middle initial)
2) UF ID Number
3) Section Number

C. Under “special codes” on your scantron, code in the test ID number 3, 4.

D. At the top right of your scantron, for “Test Form Code”, encode D.

E. 1) There are eighteen 4-point multiple-choice questions and two 4-point free response questions, for a total of 80 points.
2) The time allowed is 90 minutes.
3) You may write on the test.
4) Raise your hand if you need more scratch paper or if you have a problem with your test. DO NOT LEAVE YOUR SEAT UNLESS YOU ARE FINISHED WITH THE TEST.

F. KEEP YOUR SCANTRON COVERED AT ALL TIMES.

G. When you are finished:

1) Before turning in your test, check for transcribing errors. Any mistakes you leave in are there to stay.
2) Take your test, scratch paper, and scantron to your TA. Be prepared to show your UF ID card.
3) Answers will be posted in E-Learning after the exam.

H. By taking this exam, you agree to the following Honor Pledge:

“I will neither give nor receive any unauthorized aid for this exam.”
1. Evaluate.

\[
\log_b(b^{-3}) - \log_a \sqrt{a}
\]

A. \(\log_{ab} \sqrt{a} \)

B. \(\frac{1}{3} - \frac{1}{\log_a 2}\)

C. \(\frac{1}{3^6} - \frac{1}{2^a}\)

D. \(\frac{7}{2}\)

E. \(\frac{1}{b^3} - a^{1/2}\)

2. For CHM2045 lab, the teaching assistant needs a 12% acid solution for a demonstration. She can only find an 8% acid solution and a 15% acid solution. How many milliliters of the 15% acid solution need to be mixed with the 8% acid solution to obtain 100 ml of a 12% acid solution?

A. 33\(\frac{1}{3}\) ml of the 15% acid solution

B. 45\(\frac{1}{3}\) ml of the 15% acid solution

C. 40\(\frac{2}{3}\) ml of the 15% acid solution

D. 52\(\frac{6}{7}\) ml of the 15% acid solution

E. 57\(\frac{1}{7}\) ml of the 15% acid solution
3. Which angles are coterminal with 60°?

P. 420°
Q. −300°
R. 240°

A. R only  
B. P and Q only  
C. P and R only  
D. Q and R only  
E. Q only

4. Rewrite as a single logarithm.

\[ 5 \ln z - 3 \ln y + 4 \ln x \]

A. \( \ln \frac{x^4}{z^5y^3} \)
B. \( \ln \frac{z^5x^4}{y^3} \)
C. \( \ln(z^5 - y^3 + x^4) \)
D. Correct answer not given.
E. \( \ln \frac{z^5}{x^4y^3} \)
5. Write as a single logarithm with base 2.

\[ 3 \log_4 x + 5 \log_2 y \]

A. \( \log_2(x\sqrt{xy^5}) \)
B. \( \log_2 \sqrt{xy^3} \)
C. \( \log_2(\sqrt{xy^4}) \)
D. \( \log_2(x^2\sqrt{xy^5}) \)
E. \( \log_2(x^3y^5) \)

6. Find the amount after 5 years if $1500 is invested at 3% compounded quarterly.

A. \( A = 1500(1.0075)^5 \)
B. \( A = 1500(1.005)^{20} \)
C. \( A = 1500(1.005)^5 \)
D. \( A = 1500(1.0025)^{20} \)
E. \( A = 1500(1.0075)^{20} \)
7. A radioactive isotope used in the diagnosis of malignant tumors has a biological half-life of 3 hours. If we start with 100 milligrams of the isotope, how much is left after 12 hours.

A. \(4\frac{1}{3}\) mg  
B. \(12\frac{1}{2}\) mg  
C. 3 mg  
D. \(8\frac{1}{2}\) mg  
E. \(6\frac{1}{4}\) mg

8. Solve:

\[\log_2 4x + \log_2(x - 1) = 3\]

A. \(x = 2, 5\) only  
B. \(x = 5\) only  
C. \(x = 2\) only  
D. \(x = -1, 2\) only  
E. \(x = -4, 5\) only
9. Suppose you invest $200 in a savings account that pays 2.5% interest, compounded continuously. How long does it take to double the amount invested?

\[ A. \frac{\ln 2}{200} \text{ years} \quad B. \frac{\ln 2}{5} \text{ years} \quad C. \frac{\ln 2}{0.025} \text{ years} \]

\[ D. \frac{2}{5}e^{2.5} \text{ years} \quad E. 20e^2 \text{ years} \]

10. Solve the equations.

\[ e^{3x+2} = e^3 \quad \left(\frac{1}{5}\right)^{y-2} = 125 \quad 2^z = \frac{1}{32} \]

Find \(x + y + z\).

\[ A. \frac{17}{3} \quad B. \frac{19}{3} \quad C. \frac{19}{3} \quad D. \frac{28}{3} \quad E. \frac{17}{3} \]
11. Solve the inequality. 
\[ \frac{x + 1}{x + 3} \geq 2 \]

A. \((-\infty, -5] \cup (-3, \infty)\)  
B. \((-\infty, -3) \cup [-1, \infty)\)  
C. \((-3, \infty)\)  
D. \((-\infty, -5]\)  
E. \([-5, -3)\)

12. A ball is thrown vertically upward with an initial velocity of 112 feet per second. The distance \(s\) (in feet) of the ball from the ground after \(t\) seconds is given by \(s(t) = -16t^2 + 112t\). For what time is the ball more than 96 feet above the ground?

A. \(3 < t < 6\) seconds  
B. \(1 < t < 3\) seconds  
C. \(2 < t < 6\) seconds  
D. \(2 < t < 3\) seconds  
E. \(1 < t < 6\) seconds
13. Solve for $x$.

\[10 - 3e^x = 1\]

A. $x = \ln 6$ only 
B. $x = \ln 3$ only 
C. $x = \ln 2$ only 
D. $x = \ln 4$ only 
E. $x = \ln 4, \ln 6$ only


\[\log_2 15\]

A. 8 
B. 7 
C. 6 
D. 4 
E. 5
15. Which statements are true?

P. \( \log_{64} 8 = 2 \)

Q. \( \log_{32} 4 = \frac{2}{5} \)

R. \( \log_2 (-16) = -4 \)

A. Q and R only
B. P and Q only
C. Q only
D. R only
E. P only

16. Solve for \( x \).

\[ 4^x - 2^x - 30 = 0 \]

A. \( x = \log_2 (-4), \log_2 5 \)
B. \( x = \log_2 5 \)
C. \( x = \log_2 (-5), \log_2 6 \)
D. \( x = \log_2 6 \)
E. \( x = \log_2 10 \)
17. Which angles lie in quadrant IV?
   
   P. \(-\frac{\pi}{12}\)
   
   Q. \(\frac{15\pi}{4}\)
   
   R. \(\frac{7\pi}{6}\)

   A. P and R only  B. Q and R only  C. P, Q, and R
   D. P and Q only  E. P only

18. Find the solutions to the system of equations.

\[
(x + 2)^2 + (y - 1)^2 = 4
\]
\[
x + 1 = y
\]

What is the sum of the coordinates of ALL the solutions?

   A. -2  B. -4  C. 2  D. 4  E. 3
19. Let \( f(x) = \log_2(x - 4) - 3 \).

(a) Graph by using transformations. Start with the parent function. List the equation and label two points on each graph. Use a dashed line for asymptotes.

Equ: __________________________

Equ: __________________________

(b) List the domain of \( f \) in interval form. __________________________

(c) List the range of \( f \) in interval form. __________________________

(d) List two points on the graph. __________________________

(e) List the equation of the asymptote. __________________________

TURN OVER FOR THE LAST PROBLEM.
20. Let \( f(x) = -3 - e^{x-2} \).

(a) Graph by using transformations. Start with the parent function. List the equation and one point on each graph. Use a dashed line for asymptotes.

Equ: ____________________  Equ: ____________________

(b) List the domain of \( f \) in interval form. ____________________

(c) List the range of \( f \) in interval form. ____________________

(d) List one point on the final graph. ____________________

(e) List the equation of the asymptote. ____________________

Make sure your UF ID and answers are bubbled correctly. Turn in your scantron and your free response to your TA. You keep the test.