

MAC 1147
Fall 2019

EXAM 3A

- 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 — Do not fill this out.
- C. Under “special codes” on your scantron, code in the test ID number 3, 1.
- | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | ● | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
| ● | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
- D. At the top right of your scantron, for “Test Form Code”, encode A.
- B C D E
- 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.”

Questions 1–20 are worth 4 points each.

1. Identify the domain of the function $f(x) = \sqrt{-x^2 + 9x - 20}$

A. $(4, 5)$

B. $(-\infty, 4) \cup (5, \infty)$

C. $(-\infty, 4] \cup [5, \infty)$

D. $[4, 5]$

E. $[0, \infty)$

2. Which value of k will make the system below inconsistent (parallel lines)?

$$\begin{aligned}y &= -3x + 7 \\ 12x + ky &= 0\end{aligned}$$

A. 4

B. $\frac{1}{4}$

C. 0

D. -3

E. $-\frac{1}{3}$

3. Let $f(x) = a^x$ where $a > 0$ and $a \neq 1$. Select statement that is true for all a .
- A. $f(x)$ is increasing on $(-\infty, \infty)$.
 - B. There is at least one number k for which $f(x) = k$ has more than one solution.
 - C. $f(x) > 0$ for all x
 - D. $f(1) > f(0)$
 - E. The equation $f(x) = 0$ has a solution.
-

4. How many x -intercepts does the function $f(x) = \log_5(5^{2x}) + \log_3\left(\frac{1}{27}\right)$ have?
Hint: Simplify using the properties of logarithms

- A. 0
 - B. 1
 - C. 2
 - D. 3
 - E. More than 3
-

5. Combine into a single logarithmic term:

$$3 \ln x - 7 \ln y + \frac{1}{4} \ln z$$

- A. $\ln\left(3x - 7y + \frac{1}{4}z\right)$
 - B. $\ln(x^3 - y^7 + \sqrt[4]{z})$
 - C. $\ln\left(\frac{3xz}{28y}\right)$
 - D. $\ln\left(\frac{x^3 y^7}{\sqrt[4]{z}}\right)$
 - E. $\ln\left(\frac{x^3 \sqrt[4]{z}}{y^7}\right)$
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6. How many solutions does the equation below have?

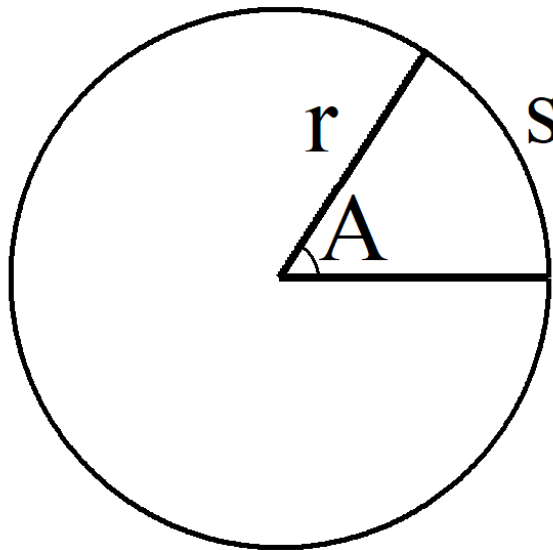
$$3xe^{-x} + 9e^{-x} = 0$$

- A. 0 B. 1 C. 2
D. 3 E. More than 3

-
7. An exponential function has a continuous growth rate of 11%. What is its doubling time?

- A. $\ln\left(\frac{2}{0.11}\right)$ B. $\frac{0.11}{\ln 2}$ C. $\frac{\ln 2}{0.11}$ D. $\frac{\ln 2}{\ln 1.11}$ E. $\ln\left(\frac{2}{1.11}\right)$

8. In the picture below, the measure of angle A is 1 radian. Select the true statement.



- A. $r = s$ B. $\pi r^2 = s^2$ C. $2\pi r = 2s$ D. $\frac{s}{r} = \pi$ E. $rs = \pi$

9. Each of the expressions below simplifies to an integer. Choose the largest one.
Hint: The change of base theorem and properties of logarithms are helpful here.

- A. $\frac{\ln(36)}{\ln(6)}$ B. $\log_{\frac{1}{5}}(5)$ C. $\log_4(16)$
 D. $\log_2(4) + \log_2(2)$ E. $\log_3(1)$

10. Severus wants to produce 25 liters of a potion that is 40% alcohol. To make it, he is going to mix x liters of a 20% alcohol potion with y liters of a 70% alcohol potion. Which of the systems below could be solved to determine the amount of each type of potion Severus needs to use?

- A. $x + y = 25$
 $x + y = 40$
- B. $x + y = 25$
 $0.2x + 0.7y = 25$
- C. $x + y = 25$
 $20x + 70y = (0.4)(25)$
- D. $x + y = 25$
 $20x + 70y = 40$
- E. $x + y = 25$
 $0.2x + 0.7y = (0.4)(25)$

-
11. A population of mosquitos is released for a study. After 1 week there were 200 mosquitos. After 5 weeks there were 1000 mosquitos. The size of the population t weeks after the release is modeled by $A(t) = Pe^{rt}$. What is the value of r ?

Note: $A(t) = Pe^{rt}$ is equivalent to $A(t) = ae^{bt}$

- A. $\frac{5}{e^6}$ B. $\frac{\ln 5}{4}$ C. $\frac{\ln 5}{5}$ D. $\ln 5$ E. $\frac{5}{e^4}$

12. Suppose that $a > 0$ and $a \neq 1$. Select the statement that is not true for all $x > 0$ and $y > 0$.

A. $a^{\log_a x} = x$

B. If $\log_a x = \log_a y$, then $x = y$.

C. $\log_a (x^y) = y \log_a (x)$

D. If $x = \log_a y$, then $a^y = x$.

E. $\log_a (a^x) = x$

13. Choose the angle that is not complementary, supplementary, or coterminal with the angle $\theta = \frac{\pi}{7}$.

A. $\frac{6\pi}{7}$

B. $\frac{13\pi}{7}$

C. $\frac{5\pi}{14}$

D. $\frac{15\pi}{7}$

E. $\frac{-13\pi}{7}$

14. Suppose $g(x) = (7a - 10)^x$. For which value of a is $g(x)$ not an exponential function?

A. $\frac{11}{7}$

B. $\frac{12}{7}$

C. 10

D. 12

E. 11

15. Find the solution to the inequality:

$$\frac{1}{x} > \frac{1}{x+5}$$

A. $(-5, 0) \cup (0, \infty)$

B. $(-\infty, \infty)$

C. $(\infty, -5) \cup (-5, 0)$

D. $(-5, 0)$

E. $(-\infty, -5) \cup (0, \infty)$

16. Identify the domain of the function $f(x) = \log_5(3 - x) + 4$

A. $(-\infty, 3)$

B. $(3, \infty)$

C. $(-3, 3)$

D. $(0, \infty)$

E. $(-\infty, \infty)$

17. Select the system that has no solutions.

A.
$$\begin{aligned} y &= -x^2 + 1 \\ y &= x^2 - 1 \end{aligned}$$

B.
$$\begin{aligned} y &= -x^2 + 1 \\ xy &= 1 \end{aligned}$$

C.
$$\begin{aligned} y &= x^2 + 1 \\ y &= -x^2 - 1 \end{aligned}$$

D.
$$\begin{aligned} y &= x^2 + 1 \\ xy &= -1 \end{aligned}$$

E.
$$\begin{aligned} y &= x^2 \\ y &= -x^2 \end{aligned}$$

18. Evaluate $\log_9(243)$.

A. $\frac{3}{2}$

B. $\frac{5}{2}$

C. 9

D. $-\frac{1}{9}$

E. 5

T.A. _____ Disc. Per. _____ Name _____

Honor Pledge: “On my honor, I have neither given nor received unauthorized aid for this exam.”

UF ID # _____ Signature _____

YOU MUST SHOW ALL WORK TO RECEIVE FULL CREDIT.

Free response questions 19–20 are worth 4 points each.

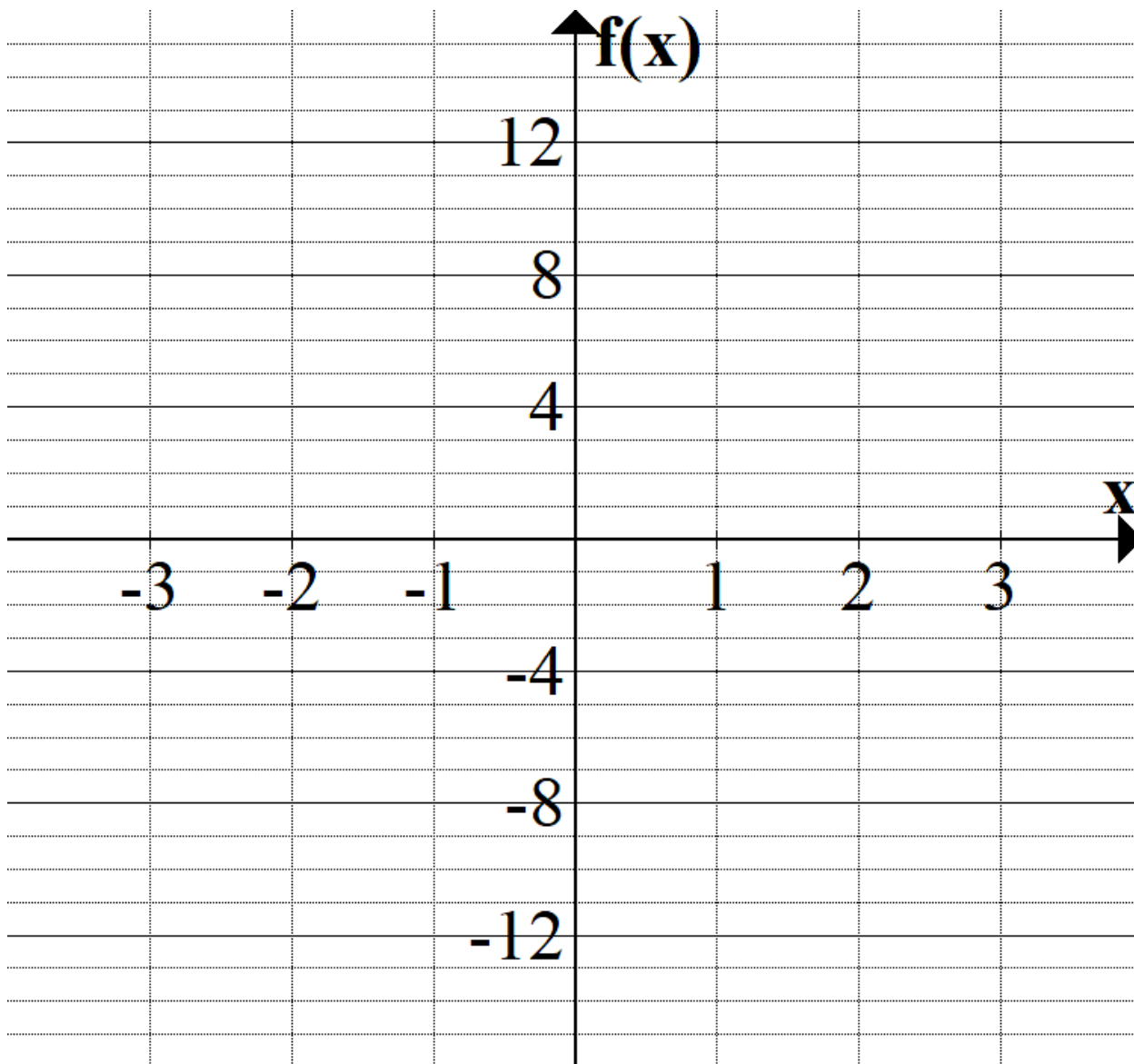
19. Solve the equation:

$$e^{2x} - 21 = 4e^x$$

$x =$ _____

TURN OVER FOR THE LAST PROBLEM.

20. Given the function $f(x) = 4\left(\frac{3}{2}\right)^x$
- a) Sketch the graph of $f(x)$ on the axes below.



- b) Identify two points on the graph: _____
- c) State the equations of any asymptotes: _____
- d) State the domain of $f(x)$ in interval notation: _____
- e) State the range of $f(x)$ in interval notation: _____

Turn in your scantron and your free response to your TA. The worked-out solutions will be posted on Canvas after the test.