
True / False (3 points each). Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle T if the statement is always true and circle F if the statement is sometimes false.

1. T F The function $f(x) = 500(.9)^x$ is an example of exponential decay.
2. T F $\ln a - \ln b = \frac{\ln a}{\ln b}$
3. T F $\ln a^b = b \ln a$
4. T F $\log_a b = \frac{\ln b}{\ln a}$
5. T F The rational function $f(x) = \frac{x-2}{x^2+x-2}$ has horizontal asymptote $y = 1$.
6. T F $\log x^r = r \log x$
7. T F $\log(bc) = \log b + \log c$
8. T F $\frac{\ln a}{\ln b} = \ln\left(\frac{a}{b}\right)$
9. T F The matrix $\left(\begin{array}{ccc|c} 1 & 0 & 2 & 3 \\ 0 & 1 & -1 & 3 \\ 0 & 0 & 0 & 0 \end{array} \right)$ indicates an inconsistent system of equations.

Multiple Choice (5 points each). Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle the letter corresponding to the best answer.

10. Which of the following is a polynomial function of degree 4 with x -intercepts $(4, 0)$, $(-3, 0)$ and $(0, 0)$?
 - A. $f(x) = x^2(x - 4)(x + 3)$
 - B. $f(x) = x(x - 4)^2(x + 3)$
 - C. $f(x) = x(x - 4)(x + 3)^2$
 - D. All of the above
 - E. None of the above.

For the following two problems, consider the following rational function:

$$f(x) = \frac{x^2 - 3}{x^2 - x - 2}$$

11. The vertical asymptote(s) are

- A. $x = \pm\sqrt{3}$
- B. $x = \pm\sqrt{3}, x = 2, x = -1$
- C. $x = 2, x = -1$
- D. there are no vertical asymptotes
- E. None of the above

12. The horizontal asymptote is

- A. $y = 0$
- B. $y = 1$
- C. $y = \frac{1}{2}$
- D. there is no horizontal asymptote
- E. None of the above

13. The system of equations

$$y = x - 4$$

$$y = 8 - \frac{7}{2}x$$

is

- A. inconsistent
- B. independent
- C. dependent
- D. a great name for a football team
- E. None of the above.

14. The system of equations

$$x - 2y = 1$$

$$2x - y = 5$$

is

- A. inconsistent
- B. independent
- C. dependent
- D. also a great name for a football team
- E. None of the above.

15. $7^{\log_7 7.4} =$
- A. 7.4
 - B. $10^{7.4}$
 - C. 10
 - D. no solution
 - E. None of the above.
16. $\log_{16} 8 =$
- A. $\frac{3}{4}$
 - B. 2
 - C. $\frac{1}{2}$
 - D. $\frac{4}{3}$
 - E. None of the above.
17. $\log_5 25$
- A. 2
 - B. $\frac{1}{2}$
 - C. -1
 - D. no solutions
 - E. None of the above.
18. $9^{2y-1} = 27^y$
- A. $y = 1$
 - B. $y = -1$
 - C. $y = 2$
 - D. no solutions
 - E. None of the above.
19. $\log(m - 2) = 1$
- A. $m = 3$
 - B. $m = -1$
 - C. $m = e + 2$
 - D. $m = 12$
 - E. None of the above.
20. Solve the equation $\left(\frac{9}{16}\right)^x = \frac{3}{4}$
- A. $x = 2$
 - B. $x = \frac{1}{2}$
 - C. $x = -2$
 - D. $x = -\frac{1}{2}$
 - E. None of the above.

21. Solve the equation $10^x = 13$

A. $p = \frac{13}{10}$

B. $p = \frac{\ln 13}{\ln 10}$

C. $p = \frac{\ln 10}{\ln 13}$

D. no solutions

E. None of the above.

Long Answer. Answer the following questions. No work = no credit.

22. (8 points) The US Census Bureau states that the United States population was 123 million, and is currently 249 million. Find an exponential model for this data, that is one in the form of $P(t) = Cb^t$, in which $t = 0$ corresponds to the year 1930 and P is the US population.

23. (4 points) Find, but **do not solve** the system of equations to represent the following situation:

An investor plans to invest \$70,000 in a mutual fund, corporate bonds, and a fast food franchise. She plans to put twice as much in bonds as in the mutual fund. Based on past performance, she expects the mutual fund to pay a 2% dividend, the bonds 10%, and the franchise 6%. She would like a dividend income of \$4800. How much should she put in each of the three investments?

24. (7 points) Find, and **solve** the system of equations to represent the following situation:

A company produces two models of bicycles, model 201 and model 301. Model 201 requires 2 hours of assembly time, and model 301 requires 3 hours of assembly time. The parts for model 201 cost \$25 per bike, and the parts for model 301 cost \$30 per bike. If the company has a total of 34 hours of assembly time and \$365 available per day for these two models, how many of each can be made in a day?