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Circle the letter corresponding to your answer. Circle only one answer per question. There is no partial credit on this portion of the exam. Answer the long answer questions on the exam itself. The exam includes 24 problems on 5 sheets of paper (including this cover sheet). You may remove this sheet to record your answers, but make sure that you put your name on both this sheet and the other part of the exam.

1. T      F
2. T      F
3. T      F
4. T      F
5. T      F
6. T      F
7. A      B      C      D      E
8. A      B      C      D      E
9. A      B      C      D      E
10. A      B      C      D      E
11. A      B      C      D      E
12. A      B      C      D      E
13. A      B      C      D      E
14. A      B      C      D      E
15. A      B      C      D      E
16. A      B      C      D      E
17. A      B      C      D      E
18. A      B      C      D      E
19. A      B      C      D      E
20. A      B      C      D      E

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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  $f(x) = \left(\frac{1}{2}\right)^x$  is an example of exponential growth.
  
2. T      F       $\log a + \log b = \log(a + b)$
  
3. T      F       $\ln e^{2.78} = 2.78$
  
4. T      F       $\ln(ab) = (\ln a)(\ln b)$
  
5. T      F       $\log_a b = \frac{\ln a}{\ln b}$
  
6. T      F      If the monthly loan payment is \$414.18 on a loan of \$35,000 and the first month the interest charged is \$215.86, then after the first payment, the amount still owed on the loan is \$34801.68.

Multiple Choice (4 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.

7.  $\log_2 8 =$

- A. 3
- B. 2
- C. 4
- D.  $-3$
- E. None of the above.

8.  $\ln \frac{1}{e} =$

- A. 1
- B.  $-1$
- C.  $\frac{1}{2}$
- D.  $-\frac{1}{2}$
- E. None of the above.

9.  $\log_4 64 =$

- A. 2
- B. 3
- C. 4
- D. 8
- E. None of the above.

10.  $\log_2 \frac{1}{\sqrt{8}} =$

- A.  $\frac{3}{2}$
- B.  $\frac{1}{2}$
- C.  $-3$
- D.  $-\frac{3}{2}$
- E. None of the above.

11. 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.

12. Solve the equation  $8^p = 19$

A.  $p = \frac{19}{8}$

B.  $p = \frac{\ln 19}{\ln 8}$

C.  $p = \frac{\ln 8}{\ln 19}$

D. no solutions

E. None of the above.

13. Solve:  $2 \cdot e^{2x+1} = 10$

A.  $x = \frac{\ln 5 - 1}{2}$

B.  $x = \frac{1}{2} \left( \frac{\ln 10}{\ln 2} - 1 \right)$

C.  $x = 2$

D.  $x = \frac{1}{2}$

E. None of the above.

14. Solve:  $\ln(2x - 1) = 3$

A.  $x = 2$

B.  $x = \frac{e^3 + 1}{2}$

C.  $x = \frac{\ln 3 - 1}{2}$

D.  $x = \frac{1}{2}$

E. None of the above.

15. The function  $f(x) = 500(.99)^x$  is an example of

A. exponential growth

B. exponential decay

C. a logarithmic function

D. a basketball team

E. None of the above.

16. The effective rate after one year if \$1000 is invested in an account paying 6% compounded quarterly is

A. 6%

B. 6.136%

C. 5.98%

D. 5.5%

E. None of the above.

17. A company has agreed to pay \$2.9 million in 5 years to settle a lawsuit. How much must they invest now in an account paying 8% compounded monthly to have that amount when it is due?
- A. \$2,805,236.99
  - B. \$28,639.98
  - C. \$1,946,510.29
  - D. \$1,973,691.27
  - E. None of the above.

18. A speculator agrees to pay \$15,000 for a parcel of land; this amount, with interest, will be paid over 4 years with semi-annual payments, at an interest rate of 10% compounded semiannually. What is the amount of each payment?
- A. \$2320.83
  - B. \$4230.18
  - C. \$2811.66
  - D. \$4732.06
  - E. None of the above.

19. You deposit \$1400 in an account at the end of each year. The account pays 8% interest compounded annually. After 8 years you have:
- A. \$14,891.29
  - B. \$11,200
  - C. \$8045.29
  - D. \$3691.29
  - E. None of the above.

20. John buys a house for \$249,900. He pays \$30,000 down and takes out a mortgage at 5.5% compounded monthly on the balance. Find the amount of interest he will pay on the loan if the length of the mortgage is 15 years.
- A. \$323,417.97
  - B. \$219,900
  - C. \$1796.77
  - D. \$103417.97
  - E. None of the above.

**Long Answer.** Answer the following questions. No work = no credit. If you need to find a vertex, show the work required for completing the square.

21. (7 points) The US Census Bureau predicts that the African-American population will increase from 35.3 million in 2000 to 59.2 million in 2050. Assuming that the population grows exponentially, and using a model like  $P(t) = Cb^t$ , find a model for this data where  $t = 0$  corresponds to the year 2000.

22. (5 points) Find the simple interest earned on an investment of \$4902 at 9.5% for 11 months.

23. (7 points) If \$1288 is deposited in an account at the end of each year at 8% compounded annually, find when you would have \$31,188.82.

24. (7 points) Find the amount of the payment necessary to amortize a loan of \$32,000 at 9.4% compounded quarterly to be repaid in 10 quarterly payments. How much is owed on the loan after the first payment is made?