Pre - Calculus Mathematics 40S

STANDARDS TEST PRACTICE EXAM

Logarithms

1. An investment earns interest at a rate of 4% compounded quarterly. How long, in years, will it take for the investment to double?

2. Solve the equation $2^{x+1} = 3(4^x)$ algebraically

3. If $\log_a 4 = p$ and $\log_a 7 = q$, determine an expression for $\log_a 28$ in terms of p and q

4. Given $f(x) = e^x$, determine the function after a reflection across the line $y = x$

5. Solve for x: $\log_2\left(\log_{16} x\right) = -2$

6. Solve for x: $\left(\dfrac{1}{2}\right)^{2x-1} = 4^x$

7. Solve algebraically: $3^{2x-1} = 5^{x+4}$

8. In April 1994, the population of a small town in Manitoba was estimated at 2500 people. The population can be represented by the equation $A = Pe^{rt}$, where r is the annual rate of increase, and t is the time in years. Determine the annual rate of increase if there were 3900 people in April 1999. State your answer to three decimal places.

9. If $\log_a x = 16$, find the value of $\log_a \sqrt{x}$

10. If $f(x) = \log x$, determine the equation of the inverse function

11. Solve for x: $\log_4 (\log_9 x) = \dfrac{1}{2}$

12. Determine the *x*-intercepts in the following equation: $y = \log(5 - 4x) - 2\log x$

13. Solve for *x* algebraically: $2^{x+4} = 3^{2x+1}$

14. If $\log_a 4 = 1.2619$ and $\log_a 5 = 1.4650$, show that $\log_a 20 = 2.7269$

15. A new automobile costs \$32,000. The value of the auto after t years is given by
$$V = 32000(0.8)^t$$

a) Determine the value after 9 years

b) How many years will it take for the value to decrease to one-eighth the initial value?
One-eighth \$32,000 is \$4000

16. Solve for x $\log_2(x+4)+\log_2(x-3)=3$

17. State the range of $f(x) = 2^{-x}$

18. Solve for x: $\left(\dfrac{1}{3}\right)^{2x} = 27^{x-5}$

19. Solve the equation: $2^{3x+1} = 9^{x+3}$. Express your answers to three decimal places

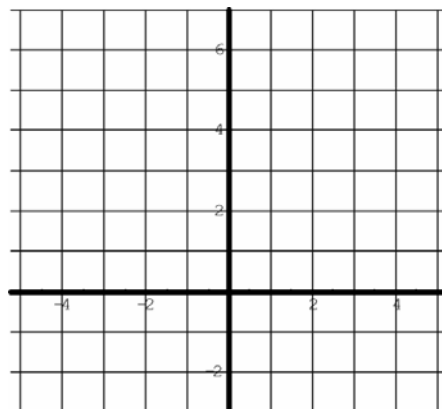**20.** Determine the domain of the function $y = \ln(x-3)$

21. Solve for x: $2^{4x-1} = 4^{x+1}$

22. Given $f(x) = \log(x+100) + 5$, evaluate $f(0)$

23. Evaluate $\left(\log_3\left(\log_2 8\right)\right)$

24. The point (64, 3) lies on the graph of $y = \log_b x$. The exact value of b is

25. Sketch a clearly labeled graph of $y = e^x + 3$

26. Given $f(x) = \log_2(x - 5)$, find an equation for $f^{-1}(x)$

27. Solve the equation: $\log(x + 2) + \log(x - 1) = 1$

28. Solve the following equation algebraically: $4(10^x) = 6^{(2-x)}$

29. The initial population of a city was 4000 and grew exponentially to 8000 in 7 years. The population growth can be modeled by the equation $A = Pe^{rt}$, where r is the annual rate of increase, and t is the time in years. Find the growth rate for this city to three decimal places.

30. Evaluate $\ln e^5$

31. Solve for x in the equation $4^x = \dfrac{1}{64}$

32. Express $\dfrac{1}{3}\log M - 5\log N$ as a single logarithm

33. The population of bacteria grows exponentially according to the equation $A = 4e^{rt}$, where P is the population at time t, r is the hourly rate of increase, and t is the time in hours. If there are 100 bacteria after 2 hours, what is the population after 8 hours?

34. Solve for x: $3(2^x) = 7^{1-x}$

35. Simplify $\log_a(4x) - \log_a(2x)$

36. The graph of $y = \ln x$ is obtained by reflecting the graph of $y = e^x$ over the line _____.

37. Evaluate $\log_7\left(\dfrac{1}{7}\right)$

38. Determine the numerical value of $\log_3 81 - \log_3 3$

39. Solve for x: $\log_3(2x+1) - \log_3(x-1) - 1 = 0$

40. Evaluate $\ln e^4 - 1$