Pre-Calculus Ch 3 Practice Test

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Write the equation in its equivalent exponential or logarithmic form:

1. $\log_b 64 = 2$ → $b^2 = 64$

2. $\log_6 216 = x$ → $6^x = 216$

3. $2^3 = x$ → $\log_2 x = 3$

4. $2^{(-2)} = \frac{1}{4}$ → $\log_2 \frac{1}{4} = -2$

Evaluate the following without the use of a calculator:

5. $\log_{10} 10$ → 1

6. $\log_3 \sqrt{3}$ → $\log_3 3^{1/2}$ → $\frac{1}{2}$

7. $\log_6 1$ → 0

8. $6^{(\log_6 15)}$ → 15

9. $\log_7 7^{(18)}$ → 18

10. $\log 1000$ → $\log_{10} 10^3$ → 3

11. $\log_{10} 10^7$ → 7

12. $\ln e$ → 1

Expand or condense the following expressions:

13. $\log_2 (8x)$ → $\log_2 8 + \log_2 x$ → $3 + \log_2 x$

14. $\log_5 \left(\frac{125}{x}\right)$ → $\log_5 125 - \log_5 x$

15. $\log_b (yz^4)$ → $\log_b y + \log_b z^4$ → $\log_b y + 4\log_b z$

16. $\log_4 \left(\frac{x-6}{x^5}\right)$ → $\log_4 (x-6) - \log_4 x^5$ → $\log_4 (x-6) - 5\log_4 x$

17. $\log_4 (x-8) - \log_4 (x-4)$ → $\log_4 \left(\frac{x-8}{x-4}\right)$

18. $3\log_6 x + 5\log_6(x-6)$

$\log_6 x^3 + \log_6 (x-6)^5$

$\log_6 (x^3 (x-6)^5)$

19. $4\log_x 2 - \log_x 8$

$\log_x 2^4 - \log_x 8$

$\log_x \left(\frac{16}{8}\right)$

$\log_x 2$

Solve the following equations:

20. $4^{(1+2x)} = 64$

$4^{1+2x} = 4^3$

$1+2x = 3$

$-1 \quad -1$

$\frac{2x}{2} = \frac{2}{2}$

$x = 1$

21. $e^{(x+8)} = \frac{1}{e^4}$

$e^{x+8} = e^{-4}$

$x + 8 = -4$

$x = -12$

Solve the exponential equation. Give the exact answer (no decimals).

22. $5^{(x+7)} = 3$

$(x+7)\ln 5 = \ln 3$

$x + 7 = \frac{\ln 3}{\ln 5}$

$x = \frac{\ln 3}{\ln 5} - 7$

23. $e^{(x+4)} = 2$

$(x+4)\ln e = \ln 2$

$x + 4 = \ln 2$

$x = \ln 2 - 4$

24. $\log_3(x-1) = -1$

$3^{-1} = x - 1$

$\frac{1}{3} = x - 1$

$x = 1 + \frac{1}{3} = \frac{4}{3}$

25. $4 + 8\ln(x) = 8$

$\frac{8\ln(x)}{8} = \frac{4}{8}$

$\ln(x) = \frac{1}{2}$

$e \qquad e$

$x = e^{1/2}$

26. $\log_6 x + \log_6(x-35) = 2$

$\log_6(x(x-35)) = 2$

$\log_6(x^2 - 35x) = 2$

$6^2 = x^2 - 35x$

$0 = x^2 - 35x - 36$

$0 = (x-36)(x+1)$

$x = 36, -1$

27. $\log_6(5x-5) = \log_6(3x+7)$

$5x - 5 = 3x + 7$

$-3x + 5 \quad -3x + 5$

$\frac{2x}{2} = \frac{12}{2}$

$x = 6$

28. $\log_{14}(x+5) = 1 - \log_{14} x$

$\log_{14}(x+5) + \log_{14} x = 1$

$\log_{14}((x+5)\cdot x) = 1$

$x^2 + 5x = 14^1$

$x^2 + 5x - 14 = 0$

$(x+7)(x-2) = 0$

$x = -7, 2$

29. $4^{(x+9)} = 8^{(x-2)}$

$2^{2(x+9)} = 2^{3(x-2)}$

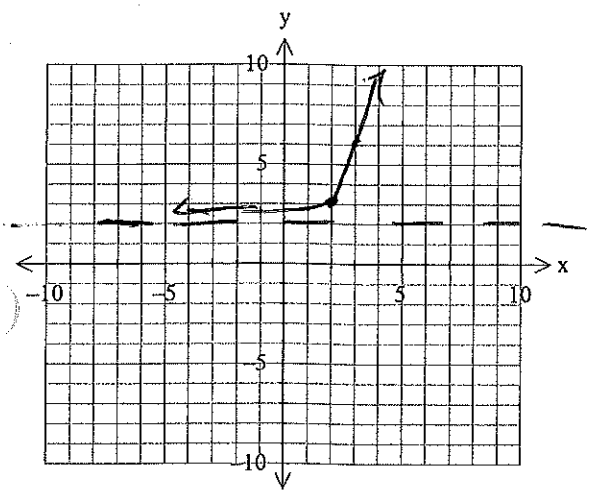
$2x + 18 = 3x - 6$

$-2x + 6 \quad -2x + 6$

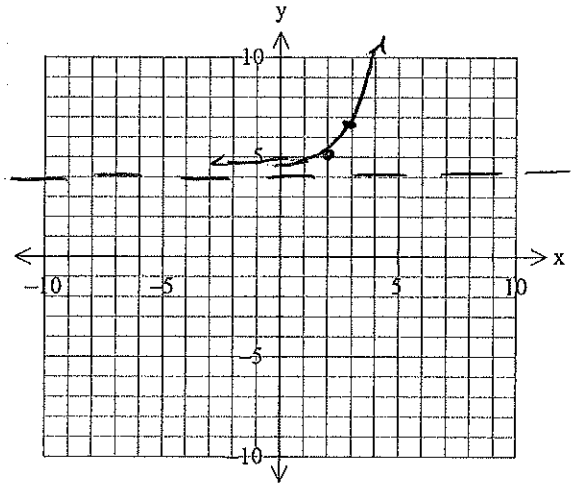
$24 = x$

Use the parent function to obtain the graph of the following:

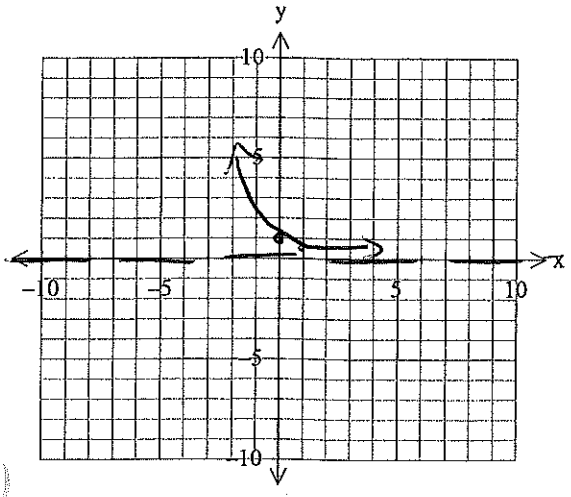
30. $g(x) = 4^{(x-2)} + 2$



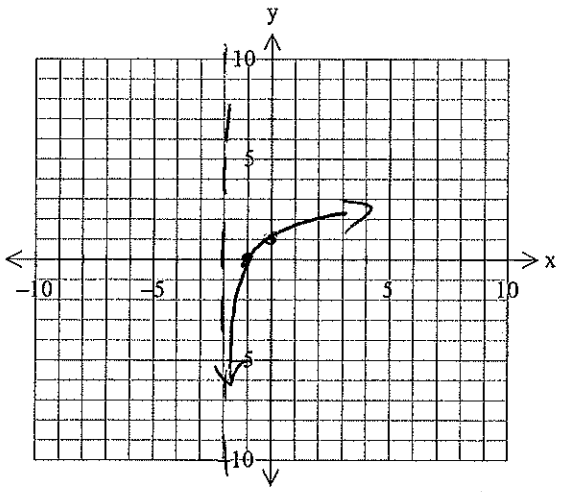
31. $g(x) = e^{(x-2)} + 4$



32. $f(x) = \left(\frac{3}{5}\right)^x$



33. $f(x) = \log_2(x+2)$



Use the compound interest formulas $A = P\left(1 + \frac{r}{n}\right)^{nt}$ *and* $A = Pe^{rt}$ to solve:

34. Find the accumulated value of an investment of $900 at 12% compounded quarterly for 6 years.

$A = 900\left(1 + \frac{0.12}{4}\right)^{4(6)} = \$1830$

35. Find the accumulated value of an investment of $4000 at 7% compounded continuously for 5 years.

$A = 4000e^{(0.07)(5)}$

$A = \$5676$

Use Newton's Law of Cooling $T = C + (T_0 - C)e^{kt}$, to solve the problem.

36. Mostacolli baked at 375°F is taken out of the oven into a kitchen that is 68°F. After 5 minutes, the temperature of the mostacolli is 327°F. What will its temperature be 19 minutes after it was taken out of the oven? Round your answer to the nearest degree.

$327 = 68 + (375 - 68)e^{K(5)}$

$327 = 68 + 307e^{5K}$

$-68 \quad -68$

$\frac{259}{307} = \frac{307e^{5K}}{307}$

$\ln\frac{259}{307} = \ln e^{5K}$

$\ln\frac{259}{307} = 5K$

$k = \frac{\ln\frac{259}{307}}{5} = -0.0340$

$T = 68 + (375 - 68)e^{(-0.034)(19)}$

$T = 229°$

Solve the following:

37. The half-life of silicon-32 is 710 years. If 50 grams is present now, how much will be present in 200 years? (Round your answer to three decimal places.)

$\frac{1}{2} = e^{K(710)}$

$\frac{\ln\frac{1}{2}}{710} = \frac{K \cdot 710}{710}$

$K = -0.000976$

$A = 50e^{-0.000976(200)}$

$A = 41.134 \text{ grams}$

38. The logistic growth function $f(t) = \frac{87{,}000}{1+1449e^{-1.2t}}$ models the number of people who have become ill with a particular infection t weeks after its initial outbreak in a particular community. How many people were ill after 9 weeks?

$$f(9) = \frac{87000}{1+1449e^{-1.2(9)}}$$

$$\boxed{f(9) = 84502}$$

39. The population of a particular country was 30 million in 1984; in 1989 it was 37 million. The exponential growth function $A = 30e^{kt}$ describes the population of this country t years after 1984. Use the fact that 5 years after 1984 the population increased by 7 million to find k to three decimal places.

$$\frac{37}{30} = \frac{30e^{k(5)}}{30}$$

$$\frac{\ln \frac{37}{30}}{5} = \frac{5k}{5}$$

$$\boxed{k = 0.042}$$

40. A fossilized leaf contains 18% of its normal amount of carbon 14. How old is the fossil (to the nearest year)? Use 5600 years as the half-life of carbon 14.

$$\frac{1}{2} = e^{k(5600)}$$

$$\frac{\ln \frac{1}{2}}{5600} = \frac{5600k}{5600}$$

$$k = -0.000124$$

$$0.18 = e^{-0.000124t}$$

$$\frac{\ln 0.18}{-0.000124} = \frac{-0.000124t}{-0.000124}$$

$$\boxed{t = 13829 \text{ years old}}$$