COLLEGE ALGEBRA EXAM 4 TG NAME _____

Show all work on this test or on separate paper.
Turn in all work sheets. Calculators required.

In 1–9, solve for the unknown:

1. $\log_2 32 = x$ 2. $\log_4 x = -2$ 3. $\log_9 x = -\frac{1}{2}$

4. $\log_6 16 = -2$ 5. $\log_4 8 = x$ 6. $\log_5 0.2 = x$

7. $\log_{10} 0 = x$ 8. $\log_6 64 = \frac{2}{3}$ 9. $\log_8 x = 0$

In 10–15, simplify:

10. $\ln e^2 =$ _____ 11. $e^{\ln x} =$ _____ 12. $\log_6 \sqrt[3]{6} =$ _____

13a) $\ln 6.5 \times 10^{23} =$ _____ 14. $\ln \sqrt{e} =$ _____ 15. $\log_6 \frac{1}{6^3} =$ _____

b) $\log 6.5 \times 10^{23} =$ _____

In 16–21, use your calculator to find the value of:
(Round to nearest hundredth or give scientific notation)

16. $\ln 70 =$ _____ 17. $e^{70} =$ _____

18. $3\ln 2 + 2\ln 3 =$ _____ 19. $7e^3 + e^{-1} =$ _____

20. $\ln 50 - \ln 2 =$ _____ 21. $\frac{\ln 50}{\ln 2} =$ _____

In 22 – 25, solve for x. Show work using laws of logarithms.

22. $5^x = 50$

23. $6^{x+1} = 8^{2x-3}$

24. $\log_3 x + \log_3 (x+8) = 2$

25. $\log_5 (x+4) - \log_5 (x-2) = \log_5 x$

26. The population of a city is given by $y = 100\, e^{0.25t}$, where t is in years.

a) Find population in 10 years.

b) How long will it take the population to double.

27. The population of a city in 1996 was 70,000. In 1998 it was 100,000. Given $y = y_0 e^{kt}$,

a) Find k

b) Use this to predict the population in the year 2006.

COLLEGE ALGEBRA EXAM 4TG NAME KEY

Show all work on this test or on separate paper.
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In 1 – 9, solve for the unknown:

1. $\log_2 32 = x$ → $2^x = 32$ → $x = 5$
2. $\log_4 x = -2$ → $4^{-2} = x$ → $x = 1/16$
3. $\log_9 x = -\frac{1}{2}$ → $9^{-1/2} = x$ → $x = \frac{1}{9^{1/2}} = \frac{1}{3}$
4. $\log_6 16 = -2$ → $6^{-2} = 16$ → $\frac{1}{6^2} = 16$ → $16 6^2 = 1$ → $6^2 = \frac{1}{16}$ → $6 = 1/4$
5. $\log_4 8 = x$ → $4^x = 8$ → $2^{2x} = 2^3$ → $x = 3/2$
6. $\log_5 0.2 = x$ → $5^{-x} = \frac{1}{5}$ → $x = -1$
7. $\log_{10} 0 = x$ use calculator! Undefined!
8. $\log_6 64 = \frac{2}{3}$ → $(6^{2/3})^{3/2} = (64)^{3/2}$ → $6 = 8^3$ → $6 = 512$
9. $\log_8 x = 0$ → $8^0 = x$ → $x = 1$

In 10 – 15, simplify:

10. $\ln e^2 =$ 2
11. $e^{\ln x} =$ x
12. $\log_6 \sqrt[3]{6} =$ $1/3$

13a) $\log 6.5 \times 10^{23} =$ 54.83
b) $\log 6.5 \times 10^{23} =$ 23.81

14. $\ln \sqrt{e} =$ $1/2$
15. $\log_6 \frac{1}{6^3} =$ -3

In 16 – 21, use your calculator to find the value of:
(Round to nearest hundredth or give scientific notation)

16. $\ln 70 =$ 4.25
17. $e^{70} =$ 2.5×10^{30}
18. $3\ln 2 + 2\ln 3 =$ 4.28 (or $\ln 8 + \ln 9 = \ln 72$)
19. $7e^3 + e^{-1} =$ 140.97 (140.5987)
20. $\ln 50 - \ln 2 =$ 3.22 ($\ln 25$)
21. $\frac{\ln 50}{\ln 2} =$ 5.64

In 22 – 25, solve for x. Show work using laws of logarithms

22. $5^x = 50$

(7) $\ln 5^x = \ln 50$

$x \ln 5 = \ln 50$

$x = \frac{\ln 50}{\ln 5}$

$= 2.43$

23. $\ln 6^{x+1} = \ln 8^{2x-3}$

(7) $(x+1)\ln 6 = (2x-3)\ln 8$

$x\ln 6 + \ln 6 = 2x\ln 8 - 3\ln 8$

$x\ln 6 - 2x\ln 8 = -3\ln 8 - \ln 6$

$x = \frac{3\ln 8 + \ln 6}{2\ln 8 - \ln 6} = \frac{8.03008}{} \approx 3.39$

24. $\log_3 x + \log_3 (x+8) = 2$

(7) $3^2 = x(x+8)$

$x^2 + 8x - 9 = 0$

$(x+9)(x-1) = 0$

$x = -9$ $x = 1$

25. $\log_5 (x+4) - \log_5 (x-2) = \log_5 x$

(7) $\frac{x+4}{x-2} = x$

$x^2 - 2x = x + 4$

$x^2 - 3x - 4 = 0$

$(x-4)(x+1) = 0$

$x = 4$ $x = -1$

26. The population of a city is given by $y = 100\, e^{0.25t}$, where t is in years.

(8)

a) Find population in 10 years.

$y = 100e^{2.5}$

$y = 1218$

b) How long will it take the population to double.

$200 = 100\, e^{0.25t}$

$2 = e^{.25t}$

$\ln 2 = .25t$

$t = 4\ln 2$

$= 2.77$ yrs

27. The population of a city in 1996 was 70,000. In 1998 it was 100,000. Given $y = y_0 e^{kt}$,

(8)

a) Find k

$100{,}000 = 70{,}000\, e^{2k}$

$\frac{10}{7} = e^{2k}$ $k \approx .178337472$

$\ln \frac{10}{7} = 2k$

b) Use this to predict the population in the year 2006.

$y = 70{,}000\, e^{10k}$ or $y = 70{,}000 (e^k)^{10}$

$= 416{,}493$