Pre-Calc Name KEY

Practice Test – Chapter 3

YOU MUST SHOW ALL YOUR WORK TO RECEIVE CREDIT!

For questions 1 – 8, simplify the expression.

1) $(-5x^3y^{-4})(2x^{-1}y)$

$(-10x^2y^{-3})$

1) $\frac{-10x^2}{y^3}$

2) $\left(\frac{12x^{-3}y^{-2}z^3}{3xy^{-2}z^{-3}}\right)^{-1}$

$(4x^{-4}y^0z^6)^{-1}$

$4^{-1}x^4z^{-6}$

2) $\frac{x^4}{4z^6}$

3) $\sqrt{5x^2} \cdot \sqrt{15x}$

$\sqrt{75x^3} = \sqrt{25 \cdot 3 \cdot x^2 \cdot x}$

$= 5x\sqrt{3x}$

3) $5x\sqrt{3x}$

4) $\frac{\sqrt{96x^4}}{\sqrt{4x}}$ $= \sqrt{24x^3}$

$= \sqrt{4 \cdot 6 \cdot x^2 \cdot x}$

$= 2x\sqrt{6x}$

4) $2x\sqrt{6x}$

5) $\sqrt{3x} + 3\sqrt{75x} + 2\sqrt{12x}$

$\sqrt{3x} + 15\sqrt{3x} + 4\sqrt{3x}$

$\sqrt{75x}$

$= \sqrt{25 \cdot 3 \cdot x}$

$= 5\sqrt{3x}$

$\sqrt{12x}$

$= \sqrt{4 \cdot 3 \cdot x}$

$= 2\sqrt{3x}$

5) $20\sqrt{3x}$

6) $\frac{2}{\sqrt{5}+\sqrt{7}} \cdot \frac{\sqrt{5}-\sqrt{7}}{\sqrt{5}-\sqrt{7}} = \frac{2\sqrt{5}-2\sqrt{7}}{5-7} = \frac{2\sqrt{5}-2\sqrt{7}}{-2}$

$= -\sqrt{5}+\sqrt{7}$

6) $-\sqrt{5}+\sqrt{7}$

7) $y\sqrt[3]{128x} - \sqrt[3]{16xy^3}$

$y\sqrt[3]{64 \cdot 2x} - \sqrt[3]{8 \cdot 2 \cdot xy^3}$

$4y\sqrt[3]{2x} - 3y\sqrt[3]{2x}$

$1y\sqrt[3]{2x}$

7) $y\sqrt[3]{2x}$

8) $(6x^{1/4})(5x^{3/2})$

$30x^{7/4}$

8) $30x^{7/4}$

For questions 9 – 16, solve the equation.

9) $2^{(3x-7)} = 4$

$\log_2 2^{3x-7} = \log_2 4$

$3x-7 = 2$

$3x = 9$

$x = 3$

9) $x = 3$

10) $e^{x+2} = 7$

$\ln e^{x+2} = \ln 7$

$x+2 = \ln 7$

$x = \ln 7 - 2$

$\approx$

10) $x \approx -0.054$

11) $e^{4x-4} - 5 = 1005$

11) $x \approx 2.73$

$e^{4x-4} = 1010$

$\ln e^{4x-4} = \ln 1010$

$4x - 4 = \ln 1010$

$x = \frac{\ln 1010 + 4}{4}$

12) $6 + 5 \ln x = 10$

12) $x \approx 2.23$

$5 \ln x = 4$

$\ln x = 4/5$

$e^{\ln x} = e^{4/5}$

$x = e^{4/5}$

13) $\log_3 (x + 6) + \log_3 (x - 6) - \log_3 x = 2$

13) $x = 12$

$\log_3 (x^2 - 36) - \log_3 (x) = 2$

$\log_3 \left(\frac{x^2-36}{x} \right) = 2$

$\frac{x^2-36}{x} = 9$

$x^2 - 36 = 9x$

$x^2 - 9x - 36 = 0$

$(x - 12)(x + 3) = 0$

$x = 12 \quad x \neq -3$

14) $\log (4 + x) - \log (x - 5) = \log 4$

14) $x = 8$

$\log \left(\frac{4+x}{x-5} \right) = \log 4$

$\frac{4+x}{x-5} = \frac{4}{1}$

$4 + x = 4x - 20$

$24 = 3x$

$8 = x$

15) $\ln x + \ln (x + 1) = \ln 90$

15) $x = 9$

$\ln (x^2 + x) = \ln 90$

$x^2 + x = 90$

$x^2 + x - 90 = 0$

$(x - 9)(x + 10) = 0$

$x = 9$

$x \neq -10$

16) $\ln (x - 8) - \ln (x + 4) = \ln (x - 5) - \ln (x + 1)$

16) $x = 2$

$\ln \left(\frac{x-8}{x+4} \right) = \ln \left(\frac{x-5}{x+1} \right)$

$\frac{x-8}{x+4} = \frac{x-5}{x+1}$

$x^2 - 7x - 8 = x^2 - x - 20$

$12 = 6x$

$2 = x$

Solve.

17) The function $A = A_0e^{-0.01155x}$ models the amount in pounds of a particular radioactive material stored in a concrete vault, where x is the number of years since the material was put into the vault. If 400 pounds of the material are placed in the vault, how much time will need to pass for only 224 pounds to remain?

17) 50.2 years

$224 = 400e^{-0.01155x}$

$0.56 = e^{-0.01155x}$

$\ln 0.56 = -0.01155x$

$x \approx 50.2$

18) An endangered species of fish has a population that is decreasing exponentially ($A = A_0e^{kt}$). The population 5 years ago was 1700. Today, only 1000 of the fish are alive. Once the population drops below 100, the situation will be irreversible. When will this happen, according to the model? (Round to the nearest whole year.)

18) 21.7 years from today

$1000 = 1700e^{k(5)}$

$0.589 = e^{5k}$

$\ln 0.589 = 5k$

$k \approx -0.106$

$100 = 1700e^{-0.106t}$

$0.059 = e^{-0.106t}$

$\ln 0.059 = -0.106t$

$t \approx 26.7$

19) The value of a particular investment follows a pattern of exponential growth. In the year 2000, you invested money in a money market account. The value of your investment t years after 2000 is given by the exponential growth model $A = 4600e^{0.057t}$. When will the account be worth \$5778?

19) 2004

$5778 = 4600e^{0.057t}$

$1.256 = e^{0.057t}$

$\ln 1.256 = 0.057t$

$t \approx 3.99$

20) Use the compound interest formulas $A = P\left(1 + \frac{r}{n}\right)^{nt}$ to solve. Suppose that you have \$3000 to invest. Which investment yields the greater return over 9 years: 5.4% compounded monthly or 5.5% compounded quarterly?

20) Quarterly

$A = 3000\left(1 + \frac{.054}{12}\right)^{12(9)}$

$A = \$4872.09$

$A = 3000\left(1 + \frac{.055}{4}\right)^{4(9)}$

$= \$4904.93$