Name:________________________

614D Chapter 5 Quiz Review

Simplify each expression. Your answer should contain only positive exponents.

1. $\left(\frac{a^{-2}b^4}{2^{-1}}\right)\left(\frac{x^3y^{10}z^{-1}}{256^3}\right)^0 + \left(\frac{b^{-2}}{5a^{-1}}\right)^{-2}$

$\left(\frac{2b^4}{a^2}\right)+\left(\frac{25b^4}{a^2}\right) = \frac{27b^4}{a^2}$

2. $(\sqrt[4]{x^3})(\sqrt{3x})$

$= \left(x^{\frac34}\right)\left(3^{\frac12}x^{\frac12}\right)$

$= 3^{\frac12}x^{\frac54} = (3^2)^{\frac14}\cdot(x^5)^{\frac14} = x\sqrt[4]{9x}$

3. $\left(\frac{1}{(y^{-1}+x^{-1})}\right)(x+y)$

$\frac{x+y}{\frac1y+\frac1x} = \frac{x+y}{\left(\frac{x+y}{xy}\right)} = xy$

4. $\left(\left(x^{\frac34}\right)^{\frac12}\left(y^{\frac23}\right)^{\frac34}\right)^{\frac13}$

$= \left(\left(x^{\frac38}\right)\left(y^{\frac12}\right)\right)^{\frac13}$

$= x^{\frac18}\cdot y^{\frac16} = x^{\frac{3}{24}}\cdot y^{\frac{4}{24}}$

$= \left(x^3y^4\right)^{\frac{1}{24}}$

$= \sqrt[24]{x^3y^4}$

5. $(3b-4)^{\frac25}$

$\sqrt[5]{9b^2-24b+16}$

Solve each equation.

6. $\left(x^{-\frac35}\right)^{-\frac53} = (27)^{-\frac53}$ $x = \frac{1}{3^5} = \frac{1}{243}$	7. $\left((2x+5)^4\right)^{\frac14} = (81)^{\frac14}$ $2x+5 = \pm 3$ $2x = 3-5$ OR $2x = -3-5$ $x = -1$ or $x = -4$ Check: $x=-1$: $(2(-1)+5)^4 \overset{?}{=} 81$ $(3)^4 = 81$ ✓ $x=-4$: $(2(-4)+5)^4 \overset{?}{=} 81$ $(-3)^4 = 81$ ✓
8. $4^{5-9x} = \frac{1}{8^{x-2}}$ $(2^2)^{5-9x} = (2^{-3})^{x-2}$ $2^{10-18x} = 2^{-3x+6}$ $10-18x = -3x+6$ $x = \frac{4}{15}$	9. $x^{\frac12}+4x^{\frac14}-32=0$ $\left(x^{\frac14}+8\right)\left(x^{\frac14}-4\right)=0$ $x^{\frac14} = -8$ OR $x^{\frac14} = 4$ $x = 4096$ $\boxed{x = 256}$ Check: $(4096)^{\frac12}+4(4096)^{\frac14}-32 \overset{?}{=} 0$ $96-32 \neq 0$ extraneous sol'n $(256)^{\frac12}+4(256)^{\frac14}-32 \overset{?}{=} 0$ $32-32=0$ ✓

10. The foundation of your house has 1200 termites. The termites grow at a rate of 2.4% per day. How long until the amount of termites double?

$A = P(1+r)^t$

$2400 = 1200(1.024)^t$

$2 = 1.024^t$

$t \approx 29$ days

11. You bought a computer for $2100 two years ago. Today it is worth $600. What is the decay rate?

$2100 = 600(1+r)^{-2}$

$(3.5)^{-\frac12} = \left((1+r)^{-2}\right)^{-\frac12}$

$0.52 = 1+r$

$r = -0.47$

Decay rate is 47%

12. You deposit \$1600 in a bank account. Find the balance after 3 years for each of the following situations: $A = P(1+\frac{r}{n})^{nt}$ $P = \$1600$ $t = 3$ years

a. Account pays 2.5% annual interest compounded monthly $n=12$ $r=0.025$

$A = 1600(1.025)^{(12\cdot3)}$

$= \$1724.48$

b. Account pays 1.75% annual interest compounded quarterly $n=4$ $r=0.0175$

$A = 1600(1.0175)^{(4\cdot3)}$

$= \$1686.05$

c. Account pays 0.4% annual interest compounded daily $n = 365$ $r = 0.004$

$A = 1600(1.004)^{(365\cdot3)}$

$= \$1619.32$

13. Osmium-182 has a half-life of 21.5 hours. How many grams of a 10 gram sample would have decayed after 3 half-lives? $A = P(\frac{1}{2})^{t/k}$

$k = 21.5$ hours

$P = 10g$

$t/k = 3$ half-lives

$A = 10(\frac{1}{2})^3 = 1.25g$ remaining after 3 half-lives

$10g - 1.25g = 8.75g$ of Osmium-182 decayed after 3 half-lives

14. When a certain medicine enters the blood stream, it gradually dilutes, decreasing exponentially with a half-life of 3 days. The initial amount of the medicine in the blood stream is A_0 milliliters. What will the amount be 30 days later?

$A = A_0(\frac{1}{2})^{t/3}$

$= A_0(\frac{1}{2})^{30/3} = \boxed{A_0(\frac{1}{2})^{10} \text{ mL}}$

15. The table shows the population P(t) (in thousands) for a small mythical nation at various times.

+25 years +25 years

t (year)	1825	1850	1875	1900	1925	1950	1975
P(t)	200	252	318	401	504	635	800

*1.26 *1.26

a. Graph the function on a separate sheet of paper.

b. How would you describe the growth of the population?

Exponential growth → constant multiplier of about 1.26 over 25 years.

c. About how long does it take for the population to double?

Approximately 75 years

d. Find and equation for P(t). (Hint: The exponent contains t – 1825)

$P(t) = 200 \cdot 2^{\frac{(t-1825)}{75}}$