Exponential Review

1. Use the exponent rules to express each of the following as a single power. Then evaluate.

a. $7^2 \times 7^3$ b. $5^6 \times 5^3$ c. $(-2)^3 \times (-2)^2$ d. $\left(\frac{2}{3}\right)^3 \times \left(\frac{2}{3}\right)^2$

e. $4^9 \div 4^7$ f. $8^{15} \div 8^{12}$ g. $(-3)^5 \div (-3)^4$ h. $\left(\frac{2}{3}\right)^3 \div \left(\frac{2}{3}\right)$

i. $\left(2^2\right)^4$ j. $\left(6^2\right)^2$ k. $\left(3^2\right)^3$ l. $\left(4^3\right)^2$

2. Use the exponent rules to express each of the following as a single POSITIVE power. Then evaluate. Express your answers in fractional form.

a. $3^4 \times 3^{-3}$ b. $4^{-2} \times 4^{-3}$ c. $(-5)^{-3} \times (-5)^5$ d. $\left(\frac{2}{3}\right)^{-3} \times \left(\frac{2}{3}\right)^{-2}$

e. $4^{-9} \div 4^{-7}$ f. $3^{-5} \div 3^2$ g. $(-9)^4 \div (-9)^4$ h. $\left(\frac{3}{4}\right)^2 \div \left(\frac{3}{4}\right)^5$

i. $\left(3^{-2}\right)^4$ j. $\left(4^2\right)^{-2}$ k. $\left(2^{-2}\right)^{-3}$ l. $\left(7^3\right)^{-1}$

3. Use the exponent rules to express each of the following as a single POSITIVE power. Then evaluate. Express your answers in fractional form.

a. $27^{\frac{2}{3}} \times 27^{\frac{4}{3}}$ b. $9^{\frac{3}{2}} \div 9^3$ c. $\left(64^{\frac{2}{3}}\right)^{-2}$ d. $\left(\frac{25}{16}\right)^{-\frac{1}{2}} \times \left(\frac{25}{16}\right)^{-1}$

4. Graph the following exponential equations. Then state the domain, range, x and y – intercepts.

a. $y = 2(3)^x$ b. $y = 4\left(\frac{1}{2}\right)^x$ c. $y = (2)^{x-5} + 3$ d. $f(x) = -(3)^{-(x+2)} - 1$

5. Today you purchased a 1975 Reggie Jackson baseball card for $40. It's value increases by 4% every year.

a. What is the equation that represents the price of the baseball card?
b. How much is the card worth in 10 years?
c. How much is the card worth in 30 years?
d. How much was the card worth 15 years ago?
e. When will the card be worth $100?

6. In 1985 there were approximately 1500 beluga whales left in the St. Lawrence Seaway. Its population is decreasing by 2.5% every year.

a. What is the equation that represents the Beluga Whale population?
b. How many whales are currently left in the St. Lawrence Seaway?
c. How many whales were present in 1950?
d. When will there be only 100 belugas left?

7. A bacteria doubles every 25 min. You initially started with 3 bacteria.
a. What is the equation that models the growth of bacteria?
b. How many bacteria are there in 75 min?
c. How many bacteria are there in 150 min?
d. How many bacteria are there in 4 hours?
e. When will there be 10 000 bacteria?

8. Plutonium-243 is a radioactive element with a half life of 5 years. Initially there is 800 grams.
a. What is the equation that models the amount of Plutonium left?
b. How much plutonium is there after 15 years?
c. How much plutonium is there after 100 years?
d. How much plutonium was there 17 years ago?
e. When will there be 5 grams of plutonium left?

8. Solve the following exponential equations.

a. $2^{x+1} = 2^9$ b. $3^{x+2} = 3^{-2}$ c. $4^{2x} = 4^8$ d. $3^{-2x+1} = 3^{x-2}$

e. $6^{5x-1} = 6^{11-x}$ f. $3^{3x} = 27$ g. $3^{x-2} = 81$ h. $2^x = \frac{1}{4}$

i. $64^x = \left(\frac{1}{4}\right)^{x+1}$ j. $4^{3x-2} = 32^{x+1}$ k. $16^{2x-5} = 8^{3x+4}$ l. $3^{2x+8} = 9^{-x-2}$

9. Solve for x.

a) $4^{x+1} + 4^x = 160$
b) $2^{x+2} + 2^x = 320$
c) $2^{x+2} - 2^x = 96$
d) $10^{x+1} - 10^x = 9000$
e) $3^{x+2} + 3^x = 30$
f) $4^{x+3} - 4^x = 63$

10. Solve.

a) $49^{x-1} = 7\sqrt{7}$
b) $2^{3x-4} = 0.25$
c) $\left(\frac{1}{4}\right)^{x+4} = \sqrt{8}$
d) $36^{2x+4} = \left(\sqrt{1296}\right)^x$
e) $2^{2x+2} + 7 = 71$
f) $9^{2x+1} = 81(27^x)$

11. Solve.

a) $4^x + 6(4^{-x}) = 5$
b) $8(5^{2x}) + 8(5^x) = 6$

will learn in gr 12

12. Rewrite each equation in logarithmic form.

a. $5^3 = 125$ b. $3^x = 28$ c. $y = 6^3$ d. $512 = 2^9$

13. Rewrite each equation in exponential form.

a. $7 = \log_2 128$ b. $x = \log_b n$ c. $\log_3 243 = 5$ d. $\log_b 4 = 19$

14. Evaluate.

a. $\log_2 16$ b. $\log_3 81$ c. $\log_2 32^3$ d. $\log 1000^{-3}$

e. $\log_6 8 + \log_6 27$ f. $\log_4 128 - \log_4 8$ g. $2\log 3 + \log\left(\frac{25}{2}\right)$

15. Solve for x, to the thousandths.

a. $x = \log_3 17$ b. $x = \log_2 0.35$ c. $4^x = 10$ d. $80 = 100\left(\frac{1}{2}\right)^x$

e. $\log(2x+10) = 2$ f. $1 - \log(2x) = 1$