Unit 6 – Exponential Functions – Review

Topics:

- Exponent Laws: Multiplying Powers, Dividing Powers, Power of a Power
- Exponent Laws: Zero and Negative Exponents
- Exponent Laws: Rational (i.e. Fraction) Exponents
- Exponential Growth & Decay
- Half-Life
- Comparing Linear, Quadratic & Exponential Functions (from graphs, equations or table of values)
- Properties of Graphs of Exponential Functions

Questions:

1. Use exponent laws to simplify each of the following. Then, evaluate.

   a) $3^4 \times 3^2 \times 3^{-2}$

   b) $\dfrac{\left(2^2\right)^3 \left(2^{-1}\right)^2 (2)}{2^8}$

   c) $\left(\dfrac{2}{3}\right)^2 \times \left(\dfrac{2}{3}\right)^{-5}$

   d) $8^{\frac{3}{4}} \times 8^{\frac{-5}{12}}$

   e) $\dfrac{9^{\frac{5}{2}}}{9}$

   f) $\left(\dfrac{9}{16}\right)^{\frac{-3}{2}}$

   g) $\left(-27\right)^{\frac{2}{3}}$

   h) $\left(\dfrac{64}{27}\right)^{\frac{-2}{3}}$

2. Simplify each of the following.

   a) $\dfrac{a^2 \left(a^3\right)^{-1} a^{-6}}{a^2}$

   b) $\left(4x^2 y\right)^3$

   c) $\dfrac{\left(3a^2 b^3\right)^3}{9ab^4}$

3. Suppose gasoline prices are expected to rise by 4% each year. The current price of gasoline is $1.10 per litre (year 2020)
   a) Find an equation to model the price of gasoline.
   b) Predict the price of gasoline in the years 2025.

4. A 2006 Honda Civic sells for $21 500. It is estimated that the civic depreciates at a rate of 14.5% per year. Predict the value of the Honda Civic in the year 2013.

5. The population of a city is growing at a rate of 2.15% per year. In the year 2010 the population was 46,000.
   a) Write an equation to model the population of the city.
   b) Predict the population of the city in the years 2015 and 2005.
   c) Estimate when the city's population will reach 90,000 people.

6. Examine each table of values below.

a) Determine the type of relationship. (Explain your answer)

b) If the function is linear or exponential, then find its equation.

i)   ii)   iii)

x	y
0	2
1	6
2	18
3	54

x	Y
0	-1
1	2
2	5
3	8

x	y
-1	2
0	1
1	2
2	5
3	10

7. Suppose the population of a town is observed and recorded in the table below.

Year	Population
2008	21 000
2009	21 840
2010	22 714

a) What type of relationship is this? (linear, exponential or quadratic)
b) Predict the population of the town in the year 2020.

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ANSWERS

1. a) $3^4 = 81$ b) $\frac{1}{8}$ c) $\frac{27}{8}$ d) $8^{\frac{1}{3}} = 2$ e) $9^{\frac{2}{3}} = 27$ f) $\frac{64}{27}$ g) 9 h) $\frac{9}{16}$ **2.** a) $\frac{1}{a^9}$ b) $64x^6y^3$ c) $3a^5b^5$

3. a) y = 1.10(1.04)ˣ b) $1.34 **4.** $7181.27 **5.** a) y = 46000(1.0215)ˣ b) 51 162, 41 359 c) around 2042
6. a) exponential, linear, quadratic b) y = (2)3ˣ, y = 3x − 1 **7.** a) exponential b) y = 21000(1.04)ˣ