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REVIEW – CHAPTER 6

6.1 – EXPONENT LAWS

1. For each question, express your answer as a **single base** and **evaluate**. An example has been provided for you

(a) $4^{-3} \times 4^{5}$
$= 4^{2}$
$= 16$

(b) $3^{-1} \times 3^{-3}$

(c) $5^{3} \times 5^{-7} \times 5^{3}$

(d) $2^{-5} \times 2^{-4} \times 2^{2}$

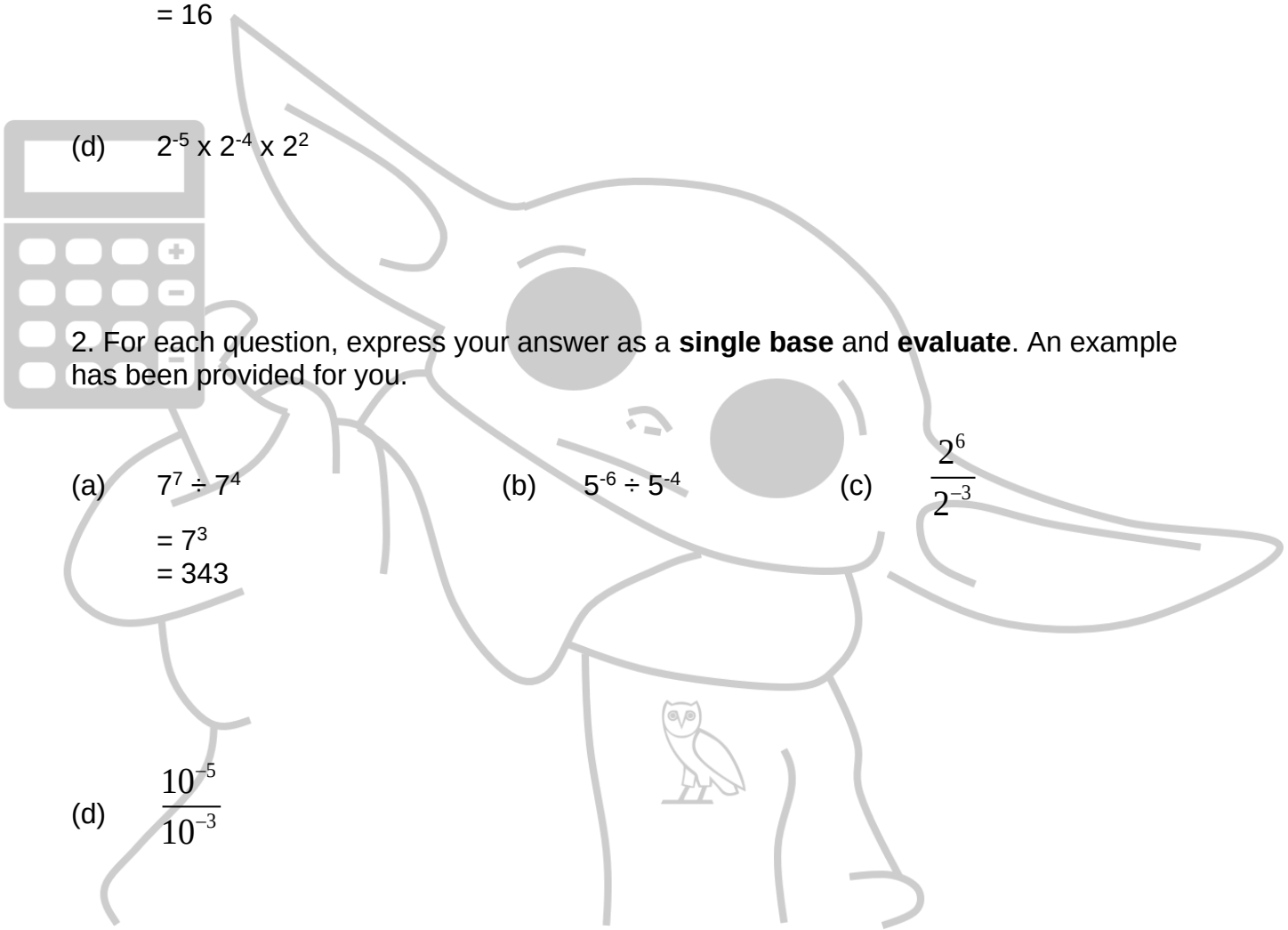
2. For each question, express your answer as a **single base** and **evaluate**. An example has been provided for you.

(a) $7^{7} \div 7^{4}$
$= 7^{3}$
$= 343$

(b) $5^{-6} \div 5^{-4}$

(c) $\dfrac{2^{6}}{2^{-3}}$

(d) $\dfrac{10^{-5}}{10^{-3}}$



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3. For each question, express your answer as a **single base** and **evaluate**. An example has been provided for you.

(a) $\left(\frac{4}{5}\right)^{-3}$ (b) $\left(\frac{3}{8}\right)^{-2}$ (c) $\left(\frac{9}{4}\right)^{-4}$

$=\left(\frac{5}{4}\right)^{3}$

$=\frac{125}{64}$

4. For each question, express your answer as a **single base** and **evaluate**. An example has been provided for you.

(a) $(4^3)^{-1}$ (b) $(5^{-1})^{-3}$ (c) $[(-2)^{-2}]^{-4}$

$=4^{-3}$

$= 1 / 64$

(d) $[(-10)^3]^{-2}$

5. Simplify each expression using Exponent Laws then substitute the given values and evaluate

(a) $(g^{-2})(g^{-1})(g^4)$, for g = 5 (b) $(w^{-5})(w^{-4})(w^7)$, for w = 3

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6. Simplify each expression using Exponent Laws then substitute the given values and evaluate

(a) $(x^{-2} \div x^{-5})$, for x = -3

(b) $(z^{-6} \div z^{-4})$ for z = 4

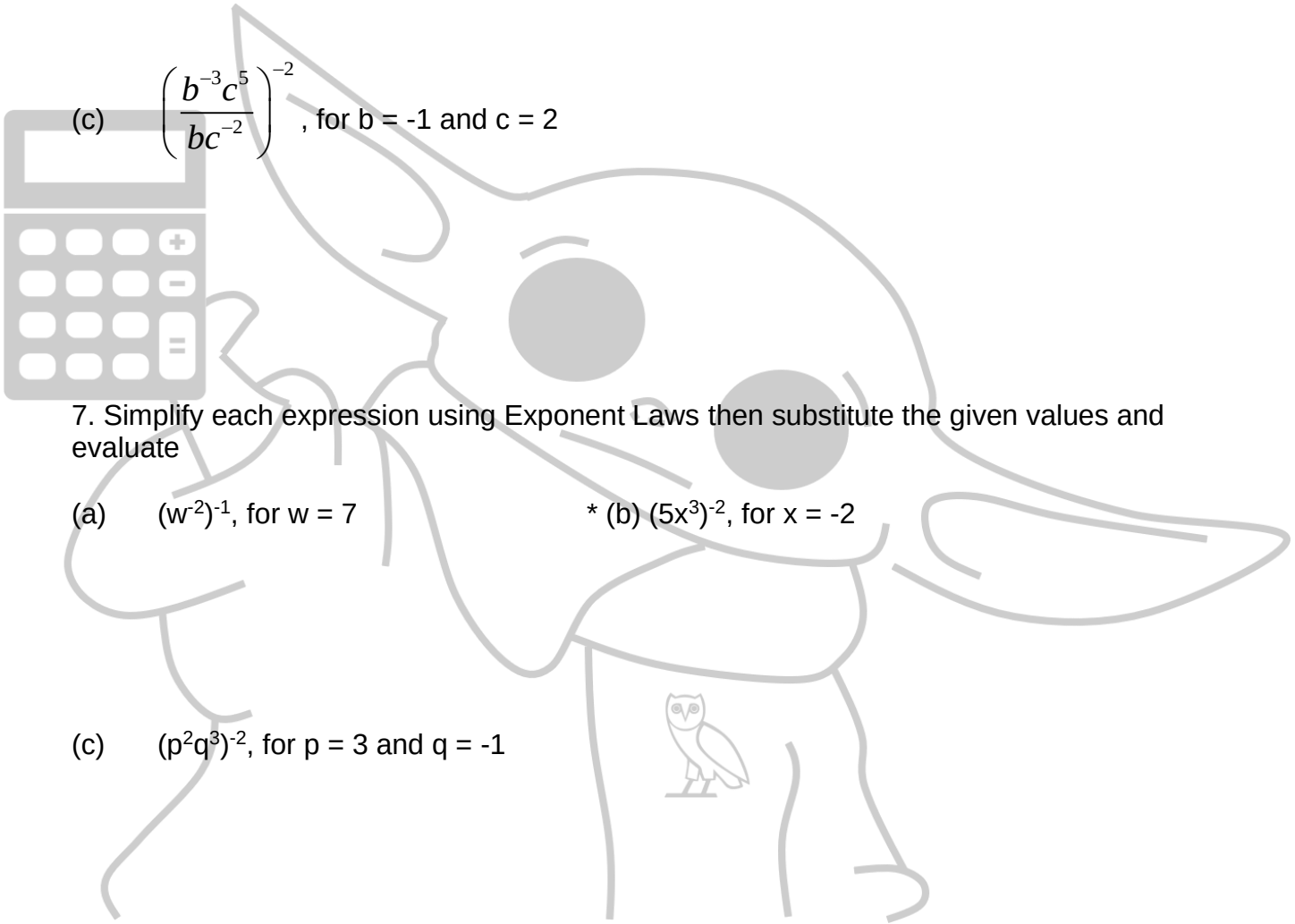
(c) $\left(\frac{b^{-3}c^{5}}{bc^{-2}}\right)^{-2}$, for b = -1 and c = 2

7. Simplify each expression using Exponent Laws then substitute the given values and evaluate

(a) $(w^{-2})^{-1}$, for w = 7

* (b) $(5x^{3})^{-2}$, for x = -2

(c) $(p^{2}q^{3})^{-2}$, for p = 3 and q = -1



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6.2 – RATIONAL EXPONENTS

1. Use your calculator to evaluate the following

(a) $\sqrt{169}$ (b) $\sqrt[4]{625}$ (c) $\sqrt[3]{64}$

(d) $\sqrt[8]{256}$

2. Evaluate each, if possible. If not possible, explain why

(a) $-\sqrt{36}$ (b) $\sqrt[5]{-100000}$ (c) $\sqrt[3]{-216}$

*(d) $\sqrt[4]{-16}$

3. Use your calculator to evaluate the following. Express your answer to three decimal places.

(a) $\sqrt[4]{68}$ (b) $\sqrt[5]{-1200}$ (c) $\sqrt[3]{94}$ (d) $\sqrt[3]{32}$

4. Write each in **radical form** and **evaluate**. An example has been provided for you

(a) $256^{\frac{1}{4}} = \sqrt[4]{256}$ (b) $10000^{\frac{1}{4}}$ (c) $128^{\frac{1}{7}}$ (d) $\left(\frac{1}{27}\right)^{\frac{1}{3}}$

5. Write each in **radical form** and **evaluate**. An example has been provided for you

(a) $64^{\frac{3}{2}} = \left(64^{\frac{1}{2}}\right)^3 = \left(\sqrt[2]{64}\right)^3$ (b) $100^{\frac{5}{2}}$ (c) $16^{\frac{3}{4}}$ (d) $81^{\frac{5}{4}}$

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6.3 – REPRESENT EXPONENTIAL EXPRESSIONS USING COMMON BASES

1. Write each power with a base of **4**. Use *Exponent Laws* if necessary to simplify. Examples have been provided for you

EXAMPLE 1

(i) 256
$= 4^4$

(ii) 16384^3
$= (4^7)^3$
$=4^{21}$

(a) 1024 (b) 64^2 (c) 16^0 (d) 256^3

2. Write each power with a base of **10**. Use *Exponent Laws* if necessary to simplify.

(a) 10000 (b) 1000^5 (c) 100000^3

3. Write each power with a base of **2**. Use *Exponent Laws* if necessary to simplify.

(a) 128 (b) 8^2 (c) 32^3 (d) 16^6

4. Use **common bases** to solve the equations below. An example has been provided

EXAMPLE

Solve $2^x = 128$

$2^x = 2^7$

$x = 7$

(a) $2^{12} = 16^x$ (b) $8^{2a+1} = 64$

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(c) $4^{3p+1} = 32$ (d) $4^{5-9k} = 8^{2-k}$

6.4 – TOOLS AND STRATEGIES TO SOLVE EQUATIONS INVOLVING EXPONENTS

1. Solve each of the following. Round decimal answers to one decimal place. An Example has been provided

EXAMPLE

Solve $x^4 = 67$

$$x = 67^{\frac{1}{4}}$$
$$x = \sqrt[4]{67}$$
$$x = 2.9$$

(a) $x^3 = 71$ (b) $5x^4 = 405$ (c) $768 = 3x^8$

(d) $8x^5 = 256$

2. Solve. Round your answer to two decimal places

(a) $\frac{4\pi r^3}{3} = 360$ (b) $8200 = 6\pi r^3$ (c) $\frac{\pi r^3}{3} = 2250$

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(d) $1000 = \frac{2\pi r^3}{3}$

3. Use systematic trial with a calculator to solve each equation below

(a) $4^x = 80$ (b) $2^x = 140$ (c) $3^x = 75$

(d) $5^x = 55$

4. Alex deposited $400 into an account that pays 3.2% per year, compounded annually. The amount in the account, **A (in dollars)**, is given by the equation **$A = 400(1.032)^n$**, where **n** represents the **number of years**. Use systematic trial to determine **how many years** it will take to <u>double</u> the amount deposited.

5. Chandra dropped a ball and recorded its height on each bounce. The equation **$h = 1.8(0.81)^n$** gives the **maximum height of the ball, h (in metres)** after **n bounces**. Determine the **maximum height** after

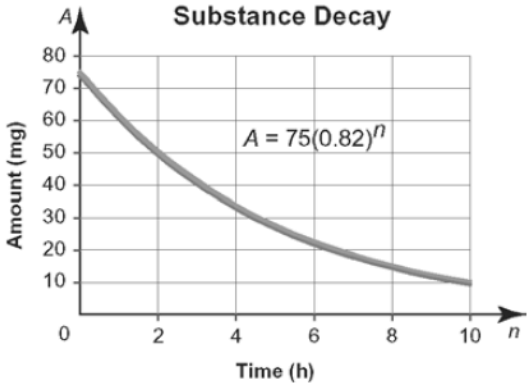
(i) **1 bounce** (ii) **3 bounces** (iii) **6 bounces**

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6.5 – CONSTRUCT AND APPLY EXPONENTIAL MODELS

1. The graph shows the amount, A, of a substance over time



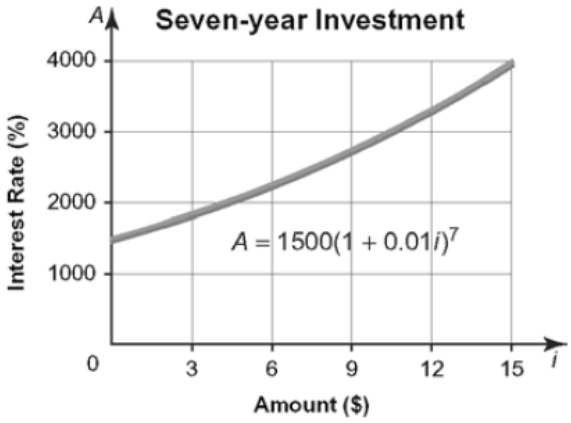
(a) Is the graph **linear, quadratic** or **exponential**? _____. Explain

(b) Use the graph or the equation (on the graph) to determine ow much of the substance remains after

(i) **3 hours** _____ (ii) **7 hours** _____

(c) How long will it take for the amount to be **reduced by half**? _____

2. The graph shows the amount, A, in a Savings account after 7 years. The annual interest rate on the account varies but is always compounded annually.



(a) Is the graph **linear, quadratic** or **exponential**? _____. Explain

(b) Use the graph or the equation to determine how much interest would be earned after 7 years at **6.3% per year**, compounded annually

(c) What annual interest rate would be needed to **double** the amount of the original investment?

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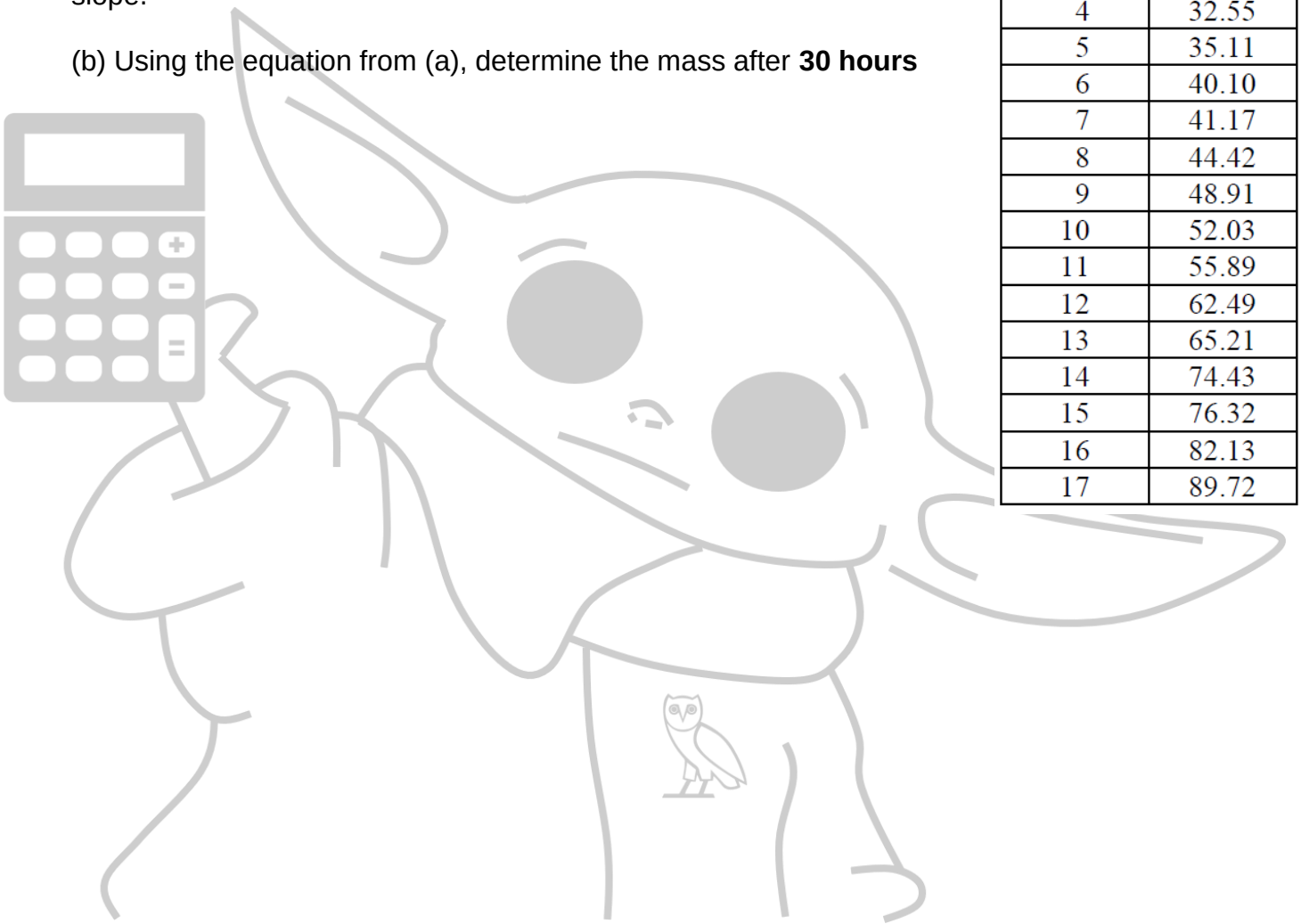
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3. The table shows the mass, over time, of a substance that is growing

Time (h)	Mass (g)
0	24.00
1	25.93
2	27.89
3	32.25
4	32.55
5	35.11
6	40.10
7	41.17
8	44.42
9	48.91
10	52.03
11	55.89
12	62.49
13	65.21
14	74.43
15	76.32
16	82.13
17	89.72

(a) Determine the **line of best fit** in the form of **y = mx + b** by choosing any two points. Use the formula $slope(m) = \frac{y_2 - y_1}{x_2 - x_1}$ to calculate the slope.

(b) Using the equation from (a), determine the mass after **30 hours**



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SOLUTIONS

6.1

1. (b) 3^{-4}, 1/81 (c) 5^{-1}, 1/5 (d) 2^{-7}, 1/128

2. (b) 5^{-2}, 1/25 (c) 2^{9}, 512 (d) 10^{-2}, 1/100

3. (a) $\left(\frac{5}{4}\right)^{3}, \frac{125}{64}$ (b) $\left(\frac{8}{3}\right)^{2}, \frac{64}{9}$ (c) $\left(\frac{4}{9}\right)^{4}, \frac{256}{6561}$

4. (a) 4^{-3}, 1/64 (b) 5^{3}, 125 (c) $(-2)^{8}$, 256
(d) $(-10)^{6}$, 1/1000000

5. (a) g, 5 (b) $1/w^{2}$, 9

6. (a) x^{3}, -27 (b) $1/z^{2}$, 1/16 (c) c^{7}/b^{4}, 128

7. (a) w^{2}, 49 (b) $1/25x^{6}$, 1/1600 (c) b^{2}/c^{3}, 16/125

6.2

1. (a) 13 (b) 5 (c) 4 (d) 2

2. (a) -6 (b) -10 (c) -6 (d) Not possible

3. (a) 2.872 (b) -4.129 (c) 4.547 (d) 3.175

4. (b) $\sqrt[4]{10000}, 10$ (c) $\sqrt[7]{128}, 2$ (d) $\sqrt[3]{\frac{1}{27}}, \frac{1}{3}$

5. (b) 100000 (c) 8 (d) 243

6.3

1. (a) 4^{5} (b) 4^{6} (c) 4^{0} (d) 4^{12}

2. (a) 10^{4} (b) 10^{15} (c) 10^{15}

3. (a) 2^{7} (b) 2^{6} (c) 2^{15} (d) 2^{24}

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4. (a) x = 3 (b) a = ½ (c) p = ½ (d) k = 4/15

6.4

1. (a) 4.1 (b) 3 (c) 2 (d) 2

2. (a) 4.41 (b) 7.58 (c) 12.90 (d) 7.28

3. (a) 3.16 (b) 7.13 (c) 3.93 (d) 2.49

4. 22 years

5. (i) 1.458 m (ii) 0.957m (iii) 0.508 m

6.5

1. (a) Exponential, graph is decreasing

   (b) (i) 41.35 g (ii) 18.70 g

   (c) 3.5 h

2. (a) Neither, Graph is curve that appears to increase at a constant rate but equation dictates it is exponential

   (b) $800.51

   (c) 10.41%

3. (a) m = 3.772, Equation y = 3.772x + 18.521. Rate of growth is 3.772g/h

   (b) 131.68 g

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