

5.1 EXPONENTS

EXPONENT LAWS

$$x^0 = 1$$

$$x^m \cdot x^n = x^{m+n}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

$$(x^m)^n = x^{mn}$$

$$x^{-n} = \frac{1}{x^n}$$

$$\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n = \frac{y^n}{x^n}$$

$$(xy)^m = x^m y^m$$

① Express as a power with a base of 2.

a) 8

$$2^3$$

b) 16^x

$$2^{4x}$$

c) 32^{2x}

$$(2^5)^{2x}$$

$$2^{10x}$$

$$d) 0.5^x$$

$$\left(\frac{1}{2}\right)^x$$

$$2^{-x}$$

$$e) \left(\frac{1}{4}\right)^{3x}$$

$$\left(2^{-2}\right)^{3x}$$

$$2^{-6x}$$

$$f) \left(\frac{1}{8}\right)^{-4x}$$

$$\left(2^{-3}\right)^{-4x}$$

$$2^{12x}$$

② Simplify a) $\frac{4^{6x+1}}{8^{4x+2}}$

$$\frac{2^{2(6x+1)}}{2^{3(4x+2)}} = \frac{2^{12x+2}}{2^{12x+6}}$$

$$= 2^{12x+2 - (12x+6)}$$

$$= 2^{-4}$$

$$= \boxed{\frac{1}{16}}$$

b) $(27^{2x+1})(9^{3x-2})$

$$(3^{6x+3})(3^{6x-4})$$

$$\boxed{3^{12x-1}}$$

③ Solve

a) $8^{3x-2} = 16^{x+1}$

$$2^{9x-6} = 2^{4x+4}$$

$$9x-6 = 4x+4$$

$$5x = 10$$

$$x = 2$$

b) $9^{3x+1} = 27^{3x}$

$$3^{6x+2} = 3^{9x}$$

$$6x+2 = 9x$$

$$2 = 3x$$

$$x = \frac{2}{3}$$

$$c) 8^{2x+1} = 1$$

$$8^{2x+1} = 8^0$$

$$2x+1=0$$

$$x = -\frac{1}{2}$$

$$2x+1=0$$

$$x = -\frac{1}{2}$$

$$d) 27^{x+3} = \left(\frac{1}{9}\right)^{2x-5}$$

$$3^{3x+9} = 3^{-4x+10}$$

$$3x+9 = -4x+10$$

$$7x = 1$$

$$x = \frac{1}{7}$$

$$e) \frac{8x+6}{16x-1} = 32 \quad 3x-4$$

$$\frac{3x+18}{8x-4} = 2 \quad 15x-20$$

$$3x+18-(8x-4) = 2 \quad 15x-20$$

$$-5x+22 = 2 \quad 15x-20$$

$$-5x+22 = 15x-20$$

$$-20x = -42$$

$$x = \frac{42}{20}$$

$$x = \frac{21}{10}$$

$$x = 2.1$$

OK

COMPOUND INTEREST

$$A = A_0 \left(1 + \frac{r}{n} \right)^{nt}$$

Initial Amount

A = final Amount P = Principal (A_0) (Amount you start with)

r = rate of yearly interest 10% $\rightarrow r = 0.10$

n = # of times interest is compounded per year

* Monthly: $n = 12$
Semi-annually: $n = 2$

t = time in years

(4) Determine the amount owing on a loan of \$5000 if the interest is compounded monthly for 2 years and the rate of interest changed is 9.5%/a.

$$A = A_0 \left(1 + \frac{r}{n} \right)^{nt}$$

$$A = 5000 \left(1 + \frac{0.095}{12} \right)^{(12)(2)}$$

$$A = \$6041.73$$

5 The interest rate is 6.5%/a. Find the amount owing on a loan of \$10000.00 if the interest is compounded quarterly for 20 months.

$$A = A_0 \left(1 + \frac{r}{n} \right)^{nt}$$

$$A = (10000) \left(1 + \frac{0.065}{4} \right)^{(4) \left(\frac{20}{12} \right)}$$

Pg 203

1(a-c), 2

9(c, e, f)

$$A = \$11134.49$$