

Worksheet 2015-10 EC-00003(2)

(1) Simplify, without using a calculator: (Write your answer as a positive exponent!)

$$(a) \frac{2 \cdot 3^x - 3^{x+1}}{3^{x-1} + 3^x}$$

$$= \frac{2 \cdot 3^x - 3^x \cdot 3^1}{3^x \cdot 3^{-1} + 3^x}$$

$$= \frac{3^x(2 - 3)}{3^x(3^{-1} + 1)}$$

$$= \frac{2 - 3}{\frac{1}{3} + 1}$$

$$= \frac{-1}{1\frac{1}{3}}$$

$$= \frac{-1}{\frac{4}{3}}$$

$$= -\frac{3}{4}$$

$$(b) \frac{18^{n-1} \times 9^{n+3}}{27^n \times 12^{1-n} \times 3^{2n} \times 8^{n-2}}$$

$$= \frac{(2^1 \times 3^2)^{n-1} \times (3^2)^{n+3}}{(3^3)^n \times (2^2 \times 3^1)^{1-n} \times 3^{2n} \times (2^3)^{n-2}}$$

$$= \frac{2^{n-1} \times 3^{2n-2} \times 3^{2n+6}}{3^{3n} \times 2^{2-2n} \times 3^{1-n} \times 3^{2n} \times 2^{3n-6}}$$

$$= \frac{2^{n-1} \times 3^{2n-2+2n+6}}{3^{3n+1-n+2n} \times 2^{2-2n+3n-6}}$$

$$= 2^{(n-1)-(n-4)} \times 3^{(4n+4)-(4n+1)}$$

$$= 2^{\frac{n-1-n+4}{1}} \times 3^{\frac{4n+4-4n-1}{1}}$$

$$= 2^3 \times 3^3 = 8 \times 27 = 216$$

$$\begin{aligned}
 \text{(c)} \quad & \left( \frac{-2x^{-2}y^3}{3x^5y^{-2}} \right)^3 \\
 &= \left( \frac{-2 x^{-2-5} y^{3-(-2)}}{3} \right)^3 \\
 &= \left( \frac{(-2)^1 x^{-7} y^5}{3^1} \right)^3 \\
 &= \frac{(-2)^3 x^{-21} y^{15}}{3^5} \\
 &= \frac{-8 x^{-21} y^{15}}{3^4 3} \\
 &= \frac{-8 y^{15}}{3^4 3 x^{21}}
 \end{aligned}$$

(2) Solve for  $x$ :

$$\text{(a)} \quad 25^{2x-3} = 125$$

$$(5^2)^{2x-3} = 5^3$$

$$5^{4x-6} = 5^3$$

$$EB \Leftrightarrow EE$$

$$\therefore 4x - 6 = 3$$

$$4x = 9$$

$$x = \frac{9}{4}$$

$$\text{(b)} \quad 64^{1-x} = 0,125$$

$$(2^6)^{1-x} = \frac{125}{1000} = \frac{1}{8} = \frac{1}{2^3}$$

$$2^{6-6x} = 2^{-3}$$

$$EB \Leftrightarrow EE$$

$$\therefore 6 - 6x = -3$$

$$-6x = -9$$

$$x = \frac{-9}{-6} = \frac{3}{2} = 1 \frac{1}{2}$$

$$(f) \quad (3^{2x} - 9) \left( \left( \frac{1}{5} \right)^{x-1} - 1 \right) = 0$$

$$3^{2x} - 9 = 0$$

$$\text{or} \quad \left( \frac{1}{5} \right)^{x-1} - 1 = 0$$

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

$$\left( \frac{1}{5} \right)^{x-1} = 1$$

$$3^{2x} = 3^2$$

$$\left( \frac{1}{5} \right)^{x-1} = \left( \frac{1}{5} \right)^0$$

$$\text{EB} \Leftrightarrow \text{EE}$$

$$\text{EB} \Leftrightarrow \text{EE}$$

$$\therefore 2x = 2$$

$$\therefore x - 1 = 0$$

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

$$x = 1$$

$$x = 1$$

$$(c) \sqrt[3]{x^4} \cdot x^{\frac{1}{2}} = 2$$

$$x^{\frac{4}{3}} \cdot x^{\frac{1}{2}} = 2$$

$$x^{\frac{4}{3} + \frac{1}{2}} = 2$$

$$x^{\frac{11}{6}} = 2$$

$$\left(x^{\frac{11}{6}}\right)^{\frac{6}{11}} = (2)^{\frac{6}{11}}$$

$$x = 2^{\frac{6}{11}}$$

$$x = \sqrt[11]{2^6} = \sqrt[11]{64}$$

$$(d) 5^{x-1} + 2.5^x = \frac{11}{125}$$

$$5^x \cdot 5^{-1} + 2 \cdot 5^x = \frac{11}{125}$$

$$5^x (5^{-1} + 2) = \frac{11}{125}$$

$$5^x \left(\frac{1}{5} + 2\right) = \frac{11}{125}$$

$$5^x \left(2\frac{1}{5}\right) = \frac{11}{125}$$

$$5^x \left(\frac{11}{5}\right) = \frac{11}{125}$$

$$5^x \left(\frac{11}{5}\right) \times \frac{5}{11} = \frac{11}{125} \times \frac{5}{11}$$

$$5^x = \frac{1}{25}$$

$$5^x = \frac{1}{5^2}$$

$$5^x = 5^{-2}$$

$$EB \Leftrightarrow EE$$

$$\therefore x = -2$$

$$(e) 8 \times 3^{4x} = 27 \times 2^{4x}$$

$$2^3 \times 3^{4x} = 3^3 \times 2^{4x}$$

$$\frac{3^{4x}}{2^{4x}} = \frac{3^3}{2^3}$$

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

$$EB \Leftrightarrow EE$$

$$\therefore 4x = 3$$

$$\therefore x = \frac{3}{4}$$