

1a) $2^x = 16_4$
 $2^x = 2^4$
 $x = 4$

c) $2^x = 128$
 $2^x = 2^7$
 $x = 7$

e) $4^4 = 256$
 $4^y = 4^4$
 $y = 4$
 g) $(-3)^x = -27$
 $(-3)^x = (-3)^3$
 $x = 3$

i) $(-5)^a = 25$
 $(-5)^a = (-5)^2$
 $a = 2$

k) $-2^x = -16_4$
 $-2^x = -2^4$
 $2^x = 2^4$
 $x = 4$

m) $-5^x = -625$
 $5^x = 625$
 $5^x = 5^4$
 $x = 4$

e) $(-1)^m = -1$

m is any odd number
 from the set of integers
 ... m is any odd integer.

2a) $7w-2 = 49$
 $7w-2 = 7 \cdot 2$
 $w-2 = 2$
 $w = 4$

c) $2^{1-x} = 128$
 $2^{1-x} = 2^7$
 $1-x = 7$
 $-x = 7-1$
 $-x = 6$
 $x = -6$

e) $5^{3x-1} = 25$
 $5^{3x-1} = 5^2$
 $3x-1 = 2$
 $3x = 3$
 $x = 1$

g) $4^{x-1} = 1$
 $4^{x-1} = 4^0$
 $x-1 = 0$
 $x = 1$

i) $(-1)^{2x} = 1$
 $x = -6$
 any x value when divided will be even AD
 $(-1)^{2x} = (+1)^x$

$1^x = 1$
 A value of x
 'A' means "for all"

3a) $6^{x+3} = 6^{2x}$

$x+3 = 2x$
 $3 = x$

check $L.S$
 6^{3+3}
 $= 6^6$
 $R.S$
 $6^{2(3)}$
 $= 6^6$

c) $3^{2y+3} = 3^{y+5}$

$2y+3 = y+5$
 $y = 2$

check $L.S$
 $3^{2(2)+3}$
 $= 3^7$
 $R.S$
 3^{2+5}
 $= 3^7$

3e) $7^{5d-1} = 7^{2d+5}$

$5d-1 = 2d+5$
 $3d = 6$
 $d = 2$

check
 $\begin{matrix} \text{LS} \\ 7^{5(2)-1} \\ = 7^{10-1} \\ = 7^9 \end{matrix} \quad \begin{matrix} \text{RS} \\ 7^{2(2)+5} \\ = 7^9 \end{matrix}$

4a) $16^{2x} = 8^{3x}$

$(2^4)^{2x} = (2^3)^{3x}$

$2^{8x} = 2^{9x}$
 $8x = 9x$
 $0 = 9x - 8x$
 $0 = x$

c) $27^{x-1} = 9^{2x}$

$(3^3)^{x-1} = (3^2)^{2x}$
 $3^{3x-3} = 3^{4x}$
 $3x-3 = 4x$
 $-3 = 4x-3x$
 $-3 = x$

e) $16^{2p+1} = 8^{3p+1}$

$(2^4)^{2p+1} = (2^3)^{3p+1}$
 $8p+4 = 9p+3$
 $4-3 = 9p-8p$
 $1 = p$

5a) $2^{x+5} = 4^{x+2}$

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

$2^{x+5} = 2^{2x+4}$
 $x+5 = 2x+4$
 $5-4 = 2x-x$
 $1 = x$

check
 $\begin{matrix} \text{LS} \\ 2^{1+5} \\ = 2^6 \\ = 64 \end{matrix} \quad \begin{matrix} \text{RS} \\ 4^{1+2} \\ = 4^3 \\ = 64 \end{matrix}$

c) $9^{2q-6} = 3^{q+6}$

$(3^2)^{2q-6} = 3^{q+6}$
 $3^{4q-12} = 3^{q+6}$
 $4q-12 = q+6$
 $3q = 18$
 $q = 6$

check
 $\begin{matrix} \text{LS} \\ 9^{2(6)-6} \\ = 9^{12-6} \\ = 9^6 \\ = (3^2)^6 \\ = 3^{12} \end{matrix} \quad \begin{matrix} \text{RS} \\ 3^{6+6} \\ = 3^{12} \end{matrix}$

e) $27^{y-1} = 9^{2y-4}$

$(3^3)^{y-1} = (3^2)^{2y-4}$
 $3y-3 = 4y-8$
 $-3+8 = 4y-3y$
 $5 = y$

check
 $\begin{matrix} \text{LS} \\ 27^{5-1} \\ = 27^4 \\ = (3^3)^4 \\ = 3^{12} \end{matrix} \quad \begin{matrix} \text{RS} \\ 9^{2(5)-4} \\ = 9^{10-4} \\ = 9^6 \\ = (3^2)^6 \\ = 3^{12} \end{matrix}$

6a) $5^{4-x} = \frac{1}{5}$

$5^{4-x} = 5^{-1}$

$4-x = -1$

$-x = -1 - 4$

$-x = -5$

$x = 5$

check

$\frac{1}{5} 5^{4-5}$

RS

$\frac{1}{5} 5^{-1}$

$= 5^{-1}$ ✓ $= \frac{1}{5}$

c) $6^{3x-7} = \frac{1}{6}$

$6^{3x-7} = 6^{-1}$

$3x-7 = -1$

$3x = -1 + 7$

$3x = 6$

$x = 2$

check

$\frac{1}{6} 6^{3(2)-7}$

$= 6^{-1}$

$= \frac{1}{6}$ ✓ $= \frac{1}{6}$

e) $5^{2n+1} = \frac{1}{125}$

$5^{2n+1} = 5^{-3}$

$2n+1 = -3$

$2n = -3 - 1$

$2n = -4$

$n = -2$

check

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

$= 5^{-3}$

$= \frac{1}{125}$ ✓ $= \frac{1}{125}$

7a) $4^x = 8$

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

$2x = 3$

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

check

$\frac{1}{8} 4^{\frac{3}{2}}$

RS

$= \frac{1}{8} 2^3$

$= \frac{1}{8} 8$ ✓

c) $(-8)^y = -2$

$[(-2)^3]^y = -2$

$(-2)^{3y} = (-2)^1$

$3y = 1$

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

check

$\frac{1}{-2} (-8)^{\frac{1}{3}}$

RS

$= \frac{1}{-2} (-2)$ ✓

e) $2^{9x} = \frac{1}{8}$

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

$9x = -3$

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

check

$\frac{1}{8} 2^{9(-\frac{1}{3})}$

RS

$= \frac{1}{8} 2^{-3}$ ✓

7g) $2^x = 16$

$2^x = (2^4)^4$

$2^x = 2^{16}$

$x = 16$

check

$\frac{1}{2} 16^{\frac{1}{16}}$ ✓

RS

$= \frac{1}{2} (2^4)^{\frac{1}{16}}$ ✓

a) $9^{2a+1} = 27$

$(3^2)^{2a+1} = 3^3$

$3^{4a+2} = 3^3$

$4a+2 = 3$

$4a = 1$

$a = \frac{1}{4}$

check

$\frac{1}{27} 9^{2(\frac{1}{4})+1}$

$= 9^{\frac{3}{2}}$

$= 9^{\frac{3}{2}}$

$= (9^{\frac{1}{2}})^3$

$= 3^3 = 27$ ✓

8a) $9^{x+1} = 27^{2x}$

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

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

~~$2x+2 = 6x$~~

$2 = 6x - 2x$

$2 = 4x$

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

~~$\frac{LS}{9^{1+1}} = 9^2$~~

~~$\frac{RS}{27^{2(1)}} = 27$~~

error! found it on first line of work.

$x \neq 1$

c) $36^{t-2} = 216^{-2t}$

$(6^2)^{t-2} = (6^3)^{-2t}$

$6^{2t-4} = 6^{-6t}$

$2t-4 = -6t$

$-4 = -6t - 2t$

$-4 = -8t$

$\frac{1}{2} = t$

check

$\frac{LS}{36^{\frac{1}{2}-2}}$

$= 36^{-\frac{3}{2}}$

$= \frac{1}{36^{\frac{3}{2}}}$

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

$= \frac{1}{216}$

$\frac{RS}{216^{-2(\frac{1}{2})}}$

$= 216^{-1}$

$= \frac{1}{216}$



check

$\frac{LS}{9^{\frac{1}{2}+1}} = 9^{\frac{3}{2}}$

$= 9^{\frac{3}{2}}$

$= (\sqrt{9})^3 = 27$

$\frac{RS}{27^{2(\frac{1}{2})}} = 27$



8e) $25^{1-3x} = 125^{-x}$

$(5^2)^{1-3x} = (5^3)^{-x}$

$5^{2-6x} = 5^{-3x}$

$2-6x = -3x$

$2 = -3x + 6x$

$2 = 3x$

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

check

$\frac{LS}{25^{1-3(\frac{2}{3})}}$

$= 25^{-1-2}$

$= 25^{-3}$

$= \frac{1}{25^3}$

$\frac{RS}{125^{-3}}$

$= \frac{1}{(3^{125})^3}$



$= \frac{1}{5^9} = \frac{1}{25^3}$

Pg 23-24 #1-11 (200)

11.5 Pg 5 of 8

9a) $5 = 25^{\frac{x}{2}}$

$5 = (5^2)^{\frac{x}{2}}$

$5^1 = 5^x$

$x=1$
check

RS $\frac{25^{\frac{x}{2}}}{5}$
✓ $= \sqrt{25}$
 $= 5$

a) $9^{\frac{y}{5}} = 27$

$3^{2y} = 3^3$

$2y = 3$

$2y = 15$
 $y = \frac{15}{2}$

check

LS $9^{\frac{15}{2} \cdot \frac{1}{5}}$
✓ $= 9^{\frac{15}{10} \cdot \frac{1}{5}}$
 $= 9^{\frac{3}{10}}$
 $= (\sqrt[10]{9})^3$
 $= 27$

RS 27

e) $4^{\frac{x}{4}} = \frac{1}{8}$

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

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

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

$x = -6$
check

LS $4^{\frac{-6}{4}}$
✓ $= 4^{-\frac{3}{2}}$
 $= \frac{1}{(\sqrt{4})^3}$
 $= \frac{1}{8}$

RS $\frac{1}{8}$

10a) $\frac{3(5^{x+1})}{3} = \frac{15}{3}$

$5^{x+1} = 5$

$5^{x+1} = 5^1$

$x+1 = 1$

$x = 0$

* order of operations * exponents 1st

since you cannot evaluate exponents with a variable must "get rid of the 3" ... cannot multiply the

3 by the 5 because that breaks rules for BEDMAS.

* get rid of the 3 by opposite of multiplying ... divide both sides by 3.

Pgs 23-24 #1-11 (200)

W1L5 Pg 6 of 8

10c) $5(4^x) = 10$

$\frac{4^x}{5} = \frac{10}{5}$

$4^x = 2$

$(2^2)^x = 2^1$

$2^{2x} = 2^1$

$2x = 1$

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

$\frac{1}{5}$ both sides

$\frac{2}{6} = 3$

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

$3^{-1} = 3$

$4f-2 = -1$

$4f = -1+2$

$4f = 1$

$f = \frac{1}{4}$

$2 \frac{1}{6}$ both sides

10e) $2 = 6(3^{4f-2})$

$\frac{2}{6} = 3$

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

$3^{-1} = 3$

$4f-2 = -1$

$4f = -1+2$

$4f = 1$

$f = \frac{1}{4}$

11a) $2^{x+2} - 2^x = 48$

$2^x(2^2 - 1) = 48$

$2^x(3) = 48$

$2^x = \frac{48}{3}$

$2^x = 16$

$2^x = 2^4$

$x = 4$

common factor

$\frac{1}{3}$

check

$\frac{48}{2^{4+2} - 2^4}$

$= \frac{48}{2^6 - 2^4}$

$= \frac{48}{64 - 16}$

$= \frac{48}{48}$

RS 48

c) $2^{a+5} + 2^a = 1056$

$2^a(2^5 + 1) = 1056$

$2^a(33) = 1056$

$2^a = \frac{1056}{33}$

$2^a = 32$

$2^a = 2^5$

$a = 5$

check

$\frac{1056}{2^{5+5} + 2^5}$

$= \frac{1056}{2^{10} + 2^5}$

$= \frac{1056}{1024 + 32}$

$= \frac{1056}{1056}$

RS 1056

Pp 23-24 #1-11 2000

1115 Pg 748

11c) $3^{x+3} - 3^{x+1} = 648$

OR

$3^{x+1} (3^2 - 1) = 648$

$3^x (3^3 - 3^1) = 648$
 $3^x (27 - 3) = 648$

$3^{x+1} (9 - 1) = 648$
 $3^{x+1} (8) = 648$

$3^x (24) = 648$
 $3^x = 27$
 $x = 3.$

$3^{x+1} = 81$

$3^{x+1} = 3^4$

$x+1 = 4$

$x = 3.$

check

L.S

$3^{3+3} - 3^{3+1}$

R.S
648

$= 3^6 - 3^4$

$= 729 - 81$

$= 648$

11g) $2^{x+2} - 2^{x+5} = -7$

OR

$2^{x+2} (1 - 2^3) = -7$

$2^{x+2} (1 - 8) = -7$

$2^{x+2} (-7) = -7$

$2^{x+2} = 1$

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

$x+2 = 0$

$x = -2$

check

L.S $2^{-2+2} - 2^{-2+5}$

$= 2^0 - 2^3$

$= 1 - 8$

$= -7$

R.S
-7

$2^x (2^2 - 2^5) = -7$
 $2^x (4 - 32) = -7$
 $2^x (-28) = -7$

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

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

$x = -2.$

pp 23-24 #1-11 (too)

11.5 pg 87/8

11 a) $5^{n+2} - 5^{n+3} = -2500$

$$5^{n+2} (1-5) = -2500$$

$$5^{n+2} (-4) = -2500$$

$$5^{n+2} = 625$$

$$5^{n+2} = 5^4$$

$$n+2=4$$

$$n=2$$

BR

$$5^n (5^2 - 5^3) = -2500$$

$$5^n (25 - 125) = -2500$$

$$5^n (-100) = -2500$$

$$5^n = 25$$

$$5^n = 5^2$$

$$n=2$$

check

RS

$$5^{2+2} - 5^{2+3} = -2500$$

$$= 5^4 - 5^5$$

$$= 625 - 3125$$

$$= -2500$$

✓