F.LE.A.4: Exponential Equations 4

1 The value of x in the equation $4^{2x+5} = 8^{3x}$ is
   1) 1
   2) 2
   3) 5
   4) −10

2 Which value of k satisfies the equation
   $8^{3k+4} = 4^{2k-1}$?
   1) −1
   2) $-\dfrac{9}{4}$
   3) −2
   4) $-\dfrac{14}{5}$

3 What is the value of b in the equation
   $4^{2b-3} = 8^{1-b}$?
   1) $\dfrac{-3}{7}$
   2) $\dfrac{7}{9}$
   3) $\dfrac{9}{7}$
   4) $\dfrac{10}{7}$

4 The solution of $8^{1-p} = 16^{2p-1}$ is
   1) $\dfrac{7}{11}$
   2) $\dfrac{3}{5}$
   3) $\dfrac{4}{9}$
   4) $\dfrac{2}{5}$

5 Solve for x: $64^{x-2} = 256^{2x}$
   1) $\dfrac{-6}{11}$
   2) $\dfrac{-6}{5}$
   3) $\dfrac{-1}{5}$
   4) 0

6 What is the value of x in the equation
   $9^{3x+1} = 27^{x+2}$?
   1) 1
   2) $\dfrac{1}{3}$
   3) $\dfrac{1}{2}$
   4) $\dfrac{4}{3}$

7 What is the value of x in the equation
   $81^{x+2} = 27^{5x+4}$?
   1) $-\dfrac{2}{11}$
   2) $-\dfrac{3}{2}$
   3) $\dfrac{4}{11}$
   4) $-\dfrac{4}{11}$

8 Solve algebraically for x: $8^{2x} = 4^6$

9 Solve for x: $4^{2x+1} = 8^{2x}$

19 Solve for x: $9^x = 27$

10 Solve for x: $4^x = 8^{x-1}$

20 Solve for x: $27^x = 9^{2x-1}$

11 If $8^{x+1} = 4^{2x}$, what is the value of x?

21 Solve for x: $27^{x+2} = 9^{2x-1}$

12 Solve for x: $4^{3x+1} = 8^{4x}$

22 Solve for x: $9^{2x} = 27^{x+1}$

13 Solve for x: $32^x = 4^{(2x+1)}$

23 If $9^{x+1} = 27^x$, what is the value of x?

14 Solve for x: $8^{x+3} = 32^{x^2-1}$

24 Solve algebraically for all values of x:

$$81^{x^3+2x^2} = 27^{\frac{5x}{3}}$$

15 Solve for x: $16^{x+4} = 32^{2x-10}$

16 Solve algebraically for x: $16^{2x+3} = 64^{x+2}$

17 Solve algebraically for x: $27^{2x+1} = 9^{4x}$

18 Solve algebraically for x: $27^x = 9^{x+2}$

F.LE.A.4: Exponential Equations 4
Answer Section

1   ANS: 2

$$4^{2x+5} = 8^{3x}$$.

$$\left(2^2\right)^{2x+5} = \left(2^3\right)^{3x}$$

$$2^{4x+10} = 2^{9x}$$

$$4x + 10 = 9x$$

$$10 = 5x$$

$$2 = x$$

   REF: 061105a2

2   ANS: 4

$$8^{3k+4} = 4^{2k-1}$$.

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

$$2^{9k+12} = 2^{4k-2}$$

$$9k + 12 = 4k - 2$$

$$5k = -14$$

$$k = -\frac{14}{5}$$

   REF: 011309a2

3   ANS: 3

$$4^{2b-3} = 8^{1-b}$$

$$\log 4^{2b-3} = \log 8^{1-b}$$

$$(2b-3)\log 4 = (1-b)\log 8$$

$$\frac{2b-3}{1-b} = \frac{\log 8}{\log 4}$$

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

$$4b - 6 = 3 - 3b$$

$$7b = 9$$
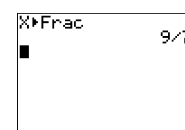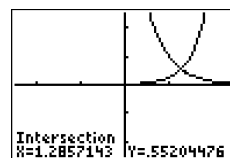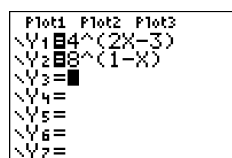
$$b = \frac{9}{7}$$

$$4^{2b-3} = 8^{1-b}$$

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

$$2^{4b-6} = 2^{3-3b}$$

$$4b - 6 = 3 - 3b$$

$$7b = 9$$

$$b = \frac{9}{7}$$

   REF: 010709b

4 ANS: 1

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

$$3 - 3p = 8p - 4$$

$$7 = 11p$$

$$\frac{7}{11} = p$$

REF: 061611a2

5 ANS: 2

$$64^{x-2} = 256^{2x}$$

$$(2^6)^{x-2} = (2^8)^{2x}$$

$$2^{6x-12} = 2^{16x}$$

$$6x - 12 = 16x$$

$$x = \frac{-6}{5}$$

$-1.2 = \dfrac{-6}{5}$

REF: fall9907b

6 ANS: 4

$$9^{3x+1} = 27^{x+2}$$

$$(3^2)^{3x+1} = (3^3)^{x+2}$$
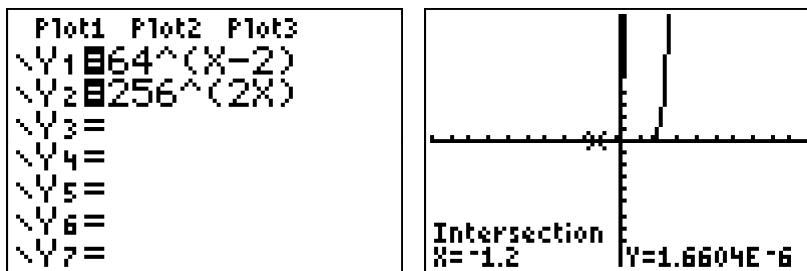
$$3^{6x+2} = 3^{3x+6}$$

$$6x + 2 = 3x + 6$$

$$3x = 4$$

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

REF: 081008a2

7 ANS: 4

$$81^{x+2} = 27^{5x+4}$$

$$\log 81^{x+2} = \log 27^{5x+4}$$

$$(x+2)\log 81 = (5x+4)\log 27$$

$$\frac{(x+2)\log 81}{\log 27} = 5x+4$$

$$\frac{4}{3}(x+2) = 5x+4$$

$$4x+8 = 15x+12$$

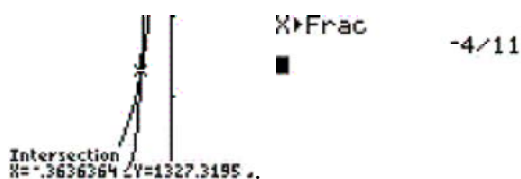$$11x = -4$$

$$x = -\frac{4}{11}$$

$$81^{x+2} = 27^{5x+4}$$

$$(3^4)^{x+2} = (3^3)^{5x+4}$$

$$4x+8 = 15x+12$$

$$11x = -4$$

$$x = -\frac{4}{11}$$

X▶Frac   -4/11
■

Intersection
X=-.3636364 Y=1327.3195

REF: 060303b

8 ANS:

$$8^{2x} = 4^6$$

$$\log 8^{2x} = \log 4^6$$

2. $$2x \cdot \log 8 = 6\log 4$$

$$x = \frac{6\log 4}{2\log 8}$$

$$x = 2$$

$$8^{2x} = 4^6$$

$$(2^3)^{2x} = (2^2)^6$$

$$6x = 12$$

$$x = 2$$

Plot1 Plot2 Plot3
\Y1■8^(2X)
\Y2■4^6
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

X	Y1	Y2
0	1	4096
1	64	4096
2	4096	4096
3	262144	4096
4	1.6E7	4096
5	1.07E9	4096
6	6.9E10	4096

X=2

REF: 010626b

9 ANS:
   1

REF: 088705siii

10 ANS:
    3

REF: 069506siii

11 ANS:
    3

REF: 069905siii

12 ANS:
    $$\frac{1}{3}$$

REF: 080309siii

13 ANS:
2

REF: 089913siii

14 ANS:

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

$$3x + 9 = 5x^2 - 5$$

$$0 = 5x^2 - 3x - 14$$

$$0 = (5x + 7)(x - 2)$$

$$x = -\frac{7}{5}, 2$$

REF: 081636a2

15 ANS:
11

REF: 010409siii

16 ANS:

$$16^{2x+3} = 64^{x+2}$$

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

$$4x + 6 = 3x + 6$$

$$x = 0$$

REF: 011128a2

17 ANS:

$$27^{2x+1} = 9^{4x}$$

$$\log 27^{2x+1} = \log 9^{4x}$$

$$(2x+1)\log 27 = 4x \cdot \log 9$$

$$\frac{(2x+1)\log 27}{\log 9} = 4x$$

$$\frac{3}{2} \cdot \qquad \frac{3}{2}(2x+1) = 4x$$

$$2x + 1 = \frac{8x}{3}$$

$$6x + 3 = 8x$$

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

$$27^{2x+1} = 9^{4x}$$
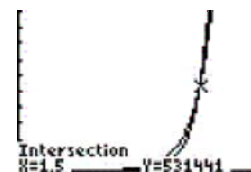
$$(3^3)^{2x+1} = (3^2)^{4x}$$

$$3^{6x+3} = 3^{8x}$$

$$6x + 3 = 8x$$

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

Plot1 Plot2 Plot3
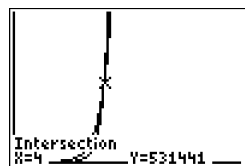\Y1■27^(2X+1)
\Y2■9^(4X)
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

Intersection
X=1.5 _____ Y=531441

REF: 060422b

18 ANS:

$$27^x = 9^{x+2}$$

$$\log 27^x = \log 9^{x+2}$$

$$x\log 27 = (x+2)\log 9$$

4. $\dfrac{x\log 27}{\log 9} = x+2$

$$\dfrac{3x}{2} = x+2$$

$$3x = 2x+4$$

$$x = 4$$

$$27^x = 9^{x+2}$$

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

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

$$3x = 2x+4$$

$$x = 4$$

```
                    WINDOW
                    Xmin=0
                    Xmax=10
                    Xscl=0
                    Ymin=0
                    Ymax=1000000
Intersection        Yscl=0
X=4        Y=531441  Xres=1
```

REF: 080922b

19 ANS:

$\dfrac{3}{2}$

REF: 068515siii

20 ANS:

2

REF: 069012siii

21 ANS:

8

REF: 019508siii

22 ANS:

3

REF: 060005siii

23 ANS:

2

REF: 080106siii

24 ANS:

$$81^{x^3 + 2x^2} = 27^{\frac{5x}{3}}$$

$$\left(3^4\right)^{x^3 + 2x^2} = \left(3^3\right)^{\frac{5x}{3}}$$

$$3^{4x^3 + 8x^2} = 3^{5x}$$

$$4x^3 + 8x^2 - 5x = 0$$

$$x(4x^2 + 8x - 5) = 0$$

$$x(2x - 1)(2x + 5) = 0$$

$$x = 0, \frac{1}{2}, -\frac{5}{2}$$

REF: 061239a2