

MATH 082 Test 3 PRACTICE

1. Solve these systems of linear equations. If there is no common solution, write "no solution."

a.  $2x - y = -4$   
 $x + y = -2$

b.  $x = 3y + 1$   
 $2x - 3y = -1$

c.  $2x + 3y = 2$   
 $3x + 2y = 143$

d.  $-x + 4y = -1$   
 $3x - 12y = 1$

2. Simplify each of the following:

a.  $x \cdot x^8 =$

b.  $(-2x^2)^3 =$

c.  $x^2 \cdot y \cdot x \cdot y^4 =$

d.  $\frac{x^{-1}}{x^{-2}} =$

3. Evaluate:  $(-2)^{-2} =$

4. Write  $1.001 \times 10^{-3}$  in standard place value notation.

5. Write  $9 \times 10^7$  in standard place value notation.

6. Write 800 in scientific notation.

7. Write 0.0000101 in scientific notation.

8. Evaluate these expressions. Leave your answer in scientific notation.

a.  $\frac{3 \times 10^4}{6 \times 10^{-3}}$

b.  $\frac{(2 \times 10^3)(4 \times 10^5)}{8 \times 10^{-5}}$

9. Multiply:

a.  $(-5x)(-7x^4)$

b.  $-2(x - 4)$

c.  $-3x(2x^2 - 4)$

d.  $(2x - 1)(x - 3)$

e.  $(2 - 3x)^2$

f.  $(x + 1)(x^2 - 3x + 1)$

10. Add or subtract as appropriate:

a.  $(2x^2 - 4x + 2) + (x^2 + 3x - 1)$

b.  $(2x - 1) - (4x^2 - 3x + 1)$

c.  $-x^2 - (3 + 2x - 4x^2)$

Answers?

1.

a.  $2x - y = -4$

$$\frac{x + y = -2}{3x + 0y = -6} \quad \text{Add}$$

$$3x = -6$$

$$x = -2$$

Substitute  $-2$  for  $x$  in  $2x - y = -4$

$$2(-2) - y = -4$$

$$-4 - y = -4$$

$$-4 + 4 - y = -4 + 4$$

$$y = 0$$

So the solution is  $(-2, 0)$

b.  $x = 3y + 1$

$$2x - 3y = -1$$

If we substitute  $3y + 1$  for  $x$  we have:

$$2(3y + 1) - 3y = -1$$

$$6y + 2 - 3y = -1$$

$$3y + 2 = -1$$

$$3y + 2 - 2 = -1 - 2$$

$$3y = -3$$

$$y = -1$$

Substitute  $-1$  for  $y$  in  $x = 3y + 1$

$$x = 3(-1) + 1$$

$$x = -3 + 1 = -2$$

So our solution is  $(-2, -1)$

c.  $2x + 3y = 2 \iff 2(2x + 3y) = (2)(2) \iff 4x + 6y = 4 \iff 4x + 6y = 4$   
 $3x + 2y = 143 \iff -3(3x + 2y) = (-3)(143) \iff -9x - 6y = -14 \iff \frac{-9x - 6y = -14}{-5x + 0y = -10}$   
 $-5x = -10$   
 $x = 2$

Then substitute  $2$  for  $x$  in  $2x + 3y = 2$ :

$$2(2) + 3y = 2$$

$$4 + 3y = 2$$

$$3y = -2$$

$$y = -2/3$$

So the solution is  $(2, -2/3)$

d.  $-x + 4y = -1$        $3(-x + 4y) = 3(-1)$        $-3x + 12y = -3$        $-3x + 12y = -3$   
 $3x - 12y = 1$        $3x - 12y = 1$        $3x - 12y = 1$        $\frac{3x - 12y = 1}{0x + 0y = -2}$

This statement,  $0 = -2$ , is absurd so there is no common solution to this system of linear equations.

2.

a.  $x \cdot x^8 = x^1 x^8 = x^{1+8} = x^9$

b.  $(-2x^2)^3 = (-2)^3(x^2)^3 = -8x^6$

c.  $x^2 \cdot y \cdot x \cdot y^4 = x^2 x^1 y^1 y^4 = x^{2+1} y^{1+4} = x^3 y^5$

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

3.  $(-2)^{-2} = \frac{1}{(-2)^2} = \frac{1}{4}$

4. Since we have  $10^{-3}$ , we move the decimal point 3 places to the LEFT: 0.001001

5. Since we have  $10^7$ , we move the decimal point 7 places to the RIGHT: 90000000

6.  $8.0 \times 10^2$  or  $8 \times 10^2$

7.  $1.01 \times 10^{-5}$

8.

a.  $\frac{3 \times 10^4}{6 \times 10^{-3}} = \frac{3}{6} \frac{10^4}{10^{-3}}$

$$= .5 \times 10^{4-(-3)}$$

$$= .5 \times 10^{4+3}$$

$$= .5 \times 10^7$$

$$= (5 \times 10^{-1})(10^7) \quad .5 \text{ isn't between 1 and 10, so we must write .5 in scientific notation.}$$

$$= 5 \times 10^{-1+7}$$

$$= 5 \times 10^6$$

b.  $\frac{(2 \times 10^3)(4 \times 10^5)}{8 \times 10^{-5}} = \frac{(2)(4)}{8} \times \frac{(10^3)(10^5)}{10^{-5}}$

$$= \frac{8}{8} \times 10^{3+5-(-5)}$$

$$= 1 \times 10^{3+5+5}$$

$$= 1 \times 10^{13}$$

9. a.  $(-5x)(-7x^4) = (-5)(-7)x^{1+4} = 35x^5$

b.  $-2(x-4) = (-2)(x) + (-2)(-4)$   
 $= -2x + 8$

c.  $-3x(2x^2-4) = (-3x)(2x^2) + (-3x)(-4)$   
 $= (-3)(2)x^1 x^2 + (-3)(-4)x$   
 $= -6x^3 + 12x$

d.  $(2x-1)(x-3) = (2x)(x-3) - 1(x-3)$   
 $= (2x)(x) + (2x)(-3) + (-1)(x) + (-1)(-3)$   
 $= 2x^2 - 6x - x + 3$   
 $= 2x^2 - 7x + 3$

e.  $(2-3x)^2 = (2-3x)(2-3x)$   
 $= (2)(2) + (2)(-3x) + (-3x)(2) + (-3x)(-3x)$   
 $= 4 - 6x - 6x + 9x^2$   
 $= 4 - 12x + 9x^2 \quad \text{or} \quad 9x^2 - 12x + 4$

$$\begin{aligned}
\text{f. } (x+1)(x^2-3x+1) &= x(x^2-3x+1) + 1(x^2-3x+1) \\
&= (x)(x^2) + (x)(-3x) + (x)(1) + 1(x^2) + 1(-3x) + 1(1) \\
&= x^3 - 3x^2 + x + x^2 - 3x + 1 \\
&= x^3 - 3x^2 + x^2 + x - 3x + 1 \\
&= x^3 + (-3+1)x^2 + (1-3)x + 1 \\
&= x^3 - 2x^2 - 2x + 1
\end{aligned}$$

$$\begin{aligned}
10. \text{ a. } (2x^2-4x+2) + (x^2+3x-1) &= 2x^2 + x^2 - 4x + 3x + 2 - 1 \\
&= (2+1)x^2 + (-4+3)x + (2-1) \\
&= 3x^2 - 1x + 1 \\
&= 3x^2 - x + 1
\end{aligned}$$

$$\begin{aligned}
\text{b. } (2x-1) - (4x^2-3x+1) &= 1(2x-1) + (-1)(4x^2-3x+1) \\
&= 2x - 1 + (-1)(4x^2) + (-1)(-3x) + (-1)(1) \\
&= 2x - 1 - 4x^2 + 3x - 1 \\
&= -4x^2 + 2x + 3x - 1 - 1 \\
&= -4x^2 + 5x - 2
\end{aligned}$$

$$\begin{aligned}
\text{c. } -x^2 - (3+2x-4x^2) &= -x^2 + (-1)(3+2x-4x^2) \\
&= -x^2 + (-1)(3) + (-1)(2x) + (-1)(-4x^2) \\
&= -x^2 - 3 - 2x + 4x^2 \\
&= 4x^2 - x^2 - 2x - 3 \\
&= (4-1)x^2 - 2x - 3 \\
&= 3x^2 - 2x - 3
\end{aligned}$$