

BY: STUDY-HACK.COM

# MAKING & USING A STUDY GUIDE

for a test

Exam-3: Polynomial Operations

Study Guide: helps you <sup>①</sup> summarize, <sup>②</sup> visualize, and <sup>③</sup> analyze concepts learned in class

\* Warning: simply making a study guide does not guarantee you an A+ on the test.

#1 Simplify by combining like terms.

$$\underline{22} - \underline{15p} + \underline{12q} - \underline{5} + \underline{2p} - \underline{19q} = \boxed{\phantom{00}}$$

$$\begin{array}{r} 22 \\ -5 \\ \hline 17 \end{array} \quad \begin{array}{r} -15p \\ 2p \\ \hline -13p \end{array} \quad \begin{array}{r} 12q \\ -19q \\ \hline -7q \end{array}$$

Note: Like terms:- are the terms that contain the same variables raised to the same power.

Rewrite as:-

$$\underline{-13p - 7q + 17}$$

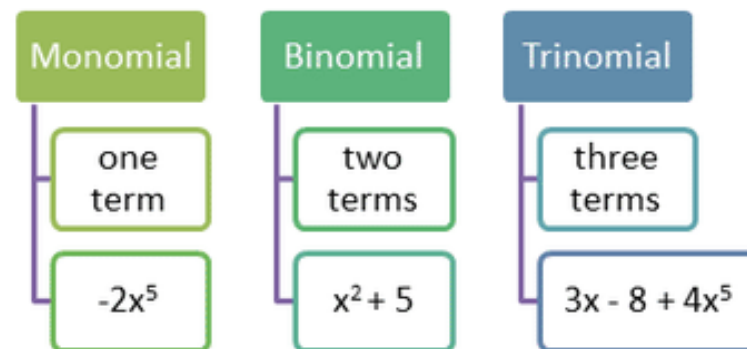
#2

Classify each polynomial by its degree and the number of terms.

$$2x^3y^3 + 2xy^3 + 3xy^2$$

$3+3$        $1+3$        $1+1$   
 $6$              $4$              $2$   
 Highest Power is the degree

Notes: The degree of a polynomial is the highest degree of a term. If more than one term with multiplication of variables, do the sum of the exponents of the variables that appear in it.



The polynomial has degree  and is a .

### Study Guide for Exam-3: Polynomial Operations

#3

Nate's architectural client said she wanted the width of every room in her house increased by 2 feet and the length decreased by 5 feet. The polynomial  $2w^2 - w - 50$  gives the area of any room in the house with  $w$  representing the room's width. The width of the kitchen is 18 feet. What is the area of the kitchen?

Substitute

$$w = 18$$

$$2(18)^2 - (18) - 50$$

$$2(324) - 18 - 50$$

$$648 - 18 - 50 = 580 \text{ as the area}$$

## Study Guide for Exam-3: Polynomial Operations

#4

A skyrocket is launched from a 20-foot-high platform, with an initial speed of 400 feet per second. If the polynomial  $3t^2 + 400t + 20$  gives the height that the rocket will rise in  $t$  seconds, how high will a rocket with a 4-second fuse rise?

Substitute  $\hookrightarrow t = 4$

$$-3(4)^2 + 400(4) + 20$$

$$-3(16) + 1600 + 20$$

$$-48 + 1620$$

1572 ft after 4 seconds.

Study Guide for Exam-3: Polynomial Operations

#5

Drag and drop the appropriate number and word into the sentence to classify the polynomial by its degree and the number of terms.

$$x^3 - x^4 + y^3 x^4$$

$$3+4=7$$

3-term

The polynomial has degree

7

and is a

trinomial

#6  
Simplify.

$$-y^6x - y^5x + y^5 + y^6x + y^5$$

$$(\cancel{-y^6x + y^6x}) - y^5x + (y^5 + y^5)$$

Group like terms.

$$-y^5x + 2y^5$$

Simplify.

## Study Guide for Exam-3: Polynomial Operations

Part 1 out of 4 #7

Claire and Richard are both artists who use square canvases. Claire uses the polynomial  $50x^2 + 150$  to decide how much to charge for her paintings and Richard uses the polynomial  $40x^2 + 250$  to decide how much to charge for his paintings. In each polynomial,  $x$  is the height of the painting in feet.

How much does Claire charge for a 6-foot painting?

$$50x^2 + 150 \quad x = 6$$

$$50(6)^2 + 150 \Rightarrow 50(36) + 150 = 1950$$

Claire charges \$1,950.

Part 2 out of 4

How much does Richard charge for a 5-foot painting?

$$40x^2 + 250 \quad x = 5$$

$$40(5)^2 + 250 \Rightarrow 40(25) + 250 = 1250$$

Richard charges \$1,250.

Part 3 out of 4

To the nearest tenth, for what height will both Claire and Richard charge the same amount for a painting? Complete the explanation on how to find the answer.

Set them equal and solve

$$50x^2 + 150 = 40x^2 + 250$$

$$\begin{array}{r} -40x^2 - 150 \\ \hline 10x^2 = 100 \\ \hline \sqrt{x^2} = \sqrt{10} \end{array}$$

$$x = \sqrt{10} \approx 3.162$$

$$\underline{= 3.2}$$

The height at which both Claire and Richard charge the same amount for a painting is 3.2.

You set the expressions equal and solve.

Part 4 out of 4

When both Claire and Richard charge the same amount for a painting, how much does each charge?

plug in  $\sqrt{10}$  in either polynomial.

$$50x^2 + 150 \quad x = \sqrt{10} \quad (\text{Use the square root, not the decimal})$$

$$50(\sqrt{10})^2 + 150 \approx 50(10) + 150$$

$$550 + 150 = 650$$



## Study Guide for Exam-3: Polynomial Operations

#8

Enrique thinks that the polynomial  $4^3x^2 + 4^4x + 4^5$  has a degree of 5 since  $3 + 2 = 4 + 1 = 5$ . Complete the explanation for his error and determine the correct degree.

$4^3x^2 + 4^4x + 4^5$

$64x^2 + 256x + 1024$

degree: 2

Highest

Enrique treated the  like , but their degree is 0. The degree of the polynomial is  from the exponent of  over the  $x$  in the term  $4^3x^2$ .

Study Guide for Exam-3: Polynomial Operations

#9

A farmer must add the areas of two plots of land to determine the amount of seed to plant. The area of Plot A can be represented by  $2x^2 + 7x - 6$ , and the area of Plot B can be represented by  $5x^2 - 3x + 14$ . Enter a polynomial that represents the **total area** of both plots of land.

$$\begin{array}{r} 2x^2 + 7x - 6 \\ + 5x^2 - 3x + 14 \\ \hline 7x^2 + 4x + 8 \end{array}$$

The polynomial for the total area of both plots of land is  $7x^2 + 4x + 8$ .

#10

Find the sum, vertically.

$$(x^2 + 5y + z) + (-5x + y - z) + 5x - y$$

$$\begin{array}{r} x^2 + 5y + z \\ -5x + y - z \\ + 5x - y \\ \hline \end{array}$$

Rewrite  
as



$$\begin{array}{r} x^2 + \quad \quad 5y + z \\ \quad -5x + y - z \\ + \quad \quad 5x - y \\ \hline x^2 + 5y \end{array}$$

#11

A pool is being filled with a large water hose. The height of the water in a pool is determined by  $7g^2 + 3g - 4$ . Previously, the pool had been filled with a different hose. Then, the height was determined by  $6g^2 + 4g - 2$ . Enter an expression that determines the height of the water in the pool if **both hoses** are on at the same time. Simplify the expression.

Add up

$$\begin{array}{r}
 7g^2 + 3g - 4. \\
 + 6g^2 + 4g - 2 \\
 \hline
 13g^2 + 7g - 6
 \end{array}$$

An expression that determines the height of the water in the pool if both hoses are on at the same time is

$$\boxed{13g^2 + 7g - 6} .$$

Study Guide for Exam-3: Polynomial Operations

#12

The polynomial  $-2x^2 + 900x$  represents the budget surplus of the town of Alphaville. Betaville's surplus is represented by  $x^2 - 100x + 80,000$ . If  $x$  represents the tax revenue in thousands from both towns, enter the expression that represents the **total surplus** of both towns together.

Add up

$$\begin{array}{r} -2x^2 + 900x \\ + \quad x^2 - 100x + 80,000 \\ \hline -x^2 + 800x + 80,000 \end{array}$$

The expression that represents the total surplus of both towns together is .

#13

The length of a rectangle is represented by  $2a + 5b$ , and its width is represented by  $4a - 4b$ . Enter the polynomial for the perimeter of the rectangle. What is the minimum perimeter of the rectangle if  $a = 12$  and  $b$  is a non-zero whole number?

$$b = 1$$

The polynomial for the perimeter of the rectangle is

$$\begin{aligned}
 P &= 2l + 2w && \text{Use the perimeter formula.} \\
 &= 2(2a + 5b) + 2(4a - 4b) && \text{Use Distributive Property.} \\
 &= \underline{4a} + \underline{10b} + \underline{8a} - \underline{8b} \Rightarrow 12a + 2b
 \end{aligned}$$

The minimum perimeter of the rectangle is .

Substitute 12 for  $a$  and 1 for  $b$ ; 1 is the lowest non-zero whole number.

$$12(12) + 2(1) \Rightarrow 144 + 2 = 146$$

## Study Guide for Exam-3: Polynomial Operations

#14

Two polynomials model different financial information for a company. The first polynomial,  $16,000 + 3x^2$  represents the gross monthly income from selling  $x$  units, while the second one,  $0.05x + 400$  represents the monthly production cost of  $x$  units.

Which of the following expressions models <sup>more</sup> gross income less production costs? Select all that apply.

$$\text{Net} = \text{Gross Income} - (\text{cost})$$

$$16,000 + 3x^2 - (0.05x + 400)$$

$$16,000 + 3x^2 - 0.05x - 400$$

$$3x^2 - 0.05x + 15,600$$

**A**

$$3x^2 - 0.05x + 15,600$$

**B**

$$(16,000 - 400) + 3x^2 - 0.05x$$

#15 Find the difference using the vertical format.

$$(-z^3 - 4z - 1) - (-z^3 + 4z + 1)$$

$$\begin{array}{r} -z^3 - 4z - 1 \\ z^3 - 4z - 1 \\ \hline -8z - 2 \end{array}$$



#16

Find the difference.

$$(-x^3 + y^2 + y - x) - (-x^3 + y + x) =$$

$$\begin{array}{r} -x^3 + y^2 + y - x \\ x^3 \quad -y - x \\ \hline y^2 - 2x \end{array}$$

#17

The number of gallons of water in a leaking pool is determined by the rate that the water is filling,  $3g^2 + 3g - 3$ , and the rate that water leaks from the pool,  $4g^2 - 3g - 2$ , where  $g$  represents the number of gallons entering or leaving the pool per minute. Enter the expression for the net change in gallons per minute of the water in the pool. Find the change in the amount when the rate,  $g$ , is 5 gallons per minute.

The change in the amount of the water is given by .

filling - (leaks)

$$\begin{array}{r}
 3g^2 + 3g - 3 \\
 - (4g^2 - 3g - 2) \\
 \hline
 \Rightarrow \begin{array}{r}
 3g^2 + 3g - 3 \\
 -4g^2 + 3g + 2 \\
 \hline
 -g^2 + 6g - 1
 \end{array}
 \end{array}$$

At a rate of 5 gallons per minutes the change of the volume will be

Substitute 5 for  $g$  in the expression.

$$-g^2 + 6g - 1 = -1(5)^2 + 6(5) - 1 = 4$$

#18

A bicycle company produces  $y$  bicycles at a cost represented by the polynomial  $y^2 + 12y + 100,000$ . The revenue for  $y$  bicycles is represented by  $2y^2 + 12y + 500$ . Find a polynomial that represents their profit. If the company only has enough materials to make 500 bicycles, should it make the bicycles?

The bicycle company's profit is given by the polynomial

$$\begin{array}{r} \text{profit} = \text{revenue} - (\text{cost}) \\ 2y^2 + 12y + 500 \\ - (y^2 + 12y + 100,000) \end{array} \Rightarrow \begin{array}{r} 2y^2 + 12y + 500 \\ -y^2 - 12y - 100,000 \\ \hline y^2 - 99,500 \end{array}$$

If the company can only make 500 bicycles, they will  (select) ▼ money.

evaluate the polynomial when  $y = 500$ .

$$y^2 - 99,500 = 1(500)^2 - 99,500 = 150,500$$

*positive means make*

#19

The polynomial  $-2x^2 + 300x$  represents the budget surplus of the town of Alphaville for the year 2010. Alphaville's surplus in 2011 can be modeled by  $-1.5x^2 + 200x$ . If  $x$  represents the yearly tax revenue in thousands, enter a polynomial for how much Alphaville's budget surplus increased from 2010 to 2011. If Alphaville took in \$650,000 in tax revenue in 2011, what was the budget surplus that year?

The surplus increased by

$$\begin{array}{r} -1.5x^2 + 200x \\ -(-2x^2 + 300x) \\ \hline \end{array} \Rightarrow \begin{array}{r} -1.5x^2 + 200x \\ 2x^2 - 300x \\ \hline 0.5x^2 - 100x \end{array}$$

Alphaville's budget surplus was \$  thousand, or \$  million.

$x = 650$

$$0.5(650)^2 - 100(650) = 146,250$$

#20

Suppose you have two polynomials regarding the financial situation of a bicycle company. The first polynomial,  $10,000 + x^2$ , represents revenue from selling  $x$  units and the second,  $0.05x + 200$ , represents the cost to produce  $x$  units.

$$\text{Profit} = \text{Revenue} - (\text{cost})$$

**A**

$$10,000 + x^2 - (0.05x + 200)$$

**B**

$$(10,000 + x^2) - 0.05x - 200$$

**C**

$$(10,000 + x^2) - 0.05y - 200$$

**D**

$$(10,000 + x^2) - 0.05x + 200$$

**E**

$$(10,000 + x^2) - (0.05x + 200)$$

#21

Hallie subtracted a quantity from the polynomial  $4y^2 + 6y - 12$  and produced the expression  $y^2 - 4$ . Enter the quantity that Hallie subtracted. Complete the explanation of how you got your answer.

Hallie subtracted the quantity  $3y^2 + 6y - 8$

You can write  $(4y^2 + 6y - 12) - P_1 = y^2 - 4$  for some polynomial  $P_1$ . By the **Subtraction Property of Equality**,  $(4y^2 + 6y - 12) - P_1 = y^2 - 4$  is equivalent to  $(4y^2 + 6y - 12) - (y^2 + 4) = P_1$ . Simplify the left side.

Note: This is a typo, should be  $-(y^2 - 4)$

$$\begin{array}{r}
 4y^2 + 6y - 12 \\
 -y^2 \quad + 4 \\
 \hline
 3y^2 + 6y - 8
 \end{array}$$

switch sign

Study Guide for Exam-3: Polynomial Operations

#22

Simplify the expression by combining like terms. Then, classify the simplified expression by degree and number of terms.

$$\underline{19} - \underline{8x^2} + 7x - \underline{2x^2} + \underline{13}$$

$$-10x^2 + 7x + 32$$

↖ degree: 2

Therefore, the simplified expression is a  degree .

Study Guide for Exam-3: Polynomial Operations

#23

Simplify the expression by combining like terms. Then, classify the simplified expression by degree and number of terms.

$$p^4 - 4p + 5p(p^3 + 5)$$

*Handwritten notes:*

- Red arrows point from the  $p$  in  $5p$  to the  $p^3$  and the  $5$  in  $(p^3 + 5)$ .
- Purple text: "Add power 1+3" with an arrow pointing to the  $p^4$  term in the expansion.
- Red underlines:  $p^4$ ,  $4p$ ,  $5p^4$ , and  $25p$ .

$$6p^4 + 21p$$

*Handwritten notes:*

- Blue text: "4<sup>th</sup> degree" with an arrow pointing to the  $6p^4$  term.

Therefore, the simplified expression is a  degree .



#24

Subtract. Enter the expression in standard form.

$$(8z^2 + 30) - (z^2 + 7z - 5) = \boxed{\phantom{0000}}$$

$$\begin{array}{r} -z^2 - 7z + 5 \\ 8z^2 \qquad \qquad 30 \\ \hline 7z^2 - 7z + 35 \end{array}$$

#25

A community swimming pool has a deep end and a shallow end. The volume of water in the deep end can be represented by  $(3x^3 + 13x^2 + 12x)$  ft<sup>3</sup> and the volume of water in the shallow end can be represented by  $(6x^3 - 108x)$  ft<sup>3</sup>. Enter an expression that represents the **total volume** of water in the pool in ft<sup>3</sup>. Enter your answer in standard form.

Add to find the total volume.

$$\begin{array}{r}
 3x^3 + 13x^2 + 12x \\
 + \quad 6x^3 \qquad \qquad -108x \\
 \hline
 9x^3 + 13x^2 - 96x
 \end{array}$$