

Instructions. (0points) This Practice Exam and is NOT to be handed in. Attempt this exam multiple times until you feel prepared to take the Exam. Show as many steps as possible when simplifying and solving so that you get partial credit on the exam for work shown.

1. Given the following polynomial, $-4x^2y^5 + 6x^3y^3 - 9x^4 - 2 + xy^2$

a) How many terms are there?

5

b) Arrange polynomial in descending order with respect to x

$$\underline{-9x^4 + 6x^3y^3 - 4x^2y^5 + xy^2 - 2}$$

c) List the coefficients as they appear in descending order.

$$\underline{-9, 6, -4, 1, -2}$$

2. Perform the following operations and simplify completely. Use POSITIVE exponents only.

$$\begin{aligned} \text{a) } (-3x + 5x^2 + 4) + (-7 - 3x^2 + 4x) &= \underline{-3x + 5x^2 + 4} + \underline{(-7) - 3x^2 + 4x} \\ &= \underline{2x^2 + x - 3} \end{aligned}$$

$$\text{b) } (a^2 + 3ab - b^2) - (11ab + 4a^2 - 9b^2)$$

$$= \underline{a^2} + \underline{3ab} - \underline{b^2} - \underline{11ab} - \underline{4a^2} + \underline{9b^2}$$

$$= \underline{-3a^2 - 8ab + 8b^2}$$

$$\text{c) } (3xy + 4x^2 - 9y^2) - (-7x^2 + y^2 + 2xy) + (4xy - 3x^2 - 14y^2)$$

$$= \underline{3xy} + \underline{4x^2} - \underline{9y^2} + \underline{7x^2} - \underline{y^2} - \underline{2xy} + \underline{4xy} - \underline{3x^2} - \underline{14y^2}$$

$$= \underline{8x^2 + 5xy - 24y^2}$$

3. Identify the base and the exponent of the following expressions. Do NOT simplify.

a) x^{15}

Base: x

Exponent: 15

b) $(9y)^3$

Base: $9y$

Exponent: 3

c) $-4z^2$

Base:

z

Exponent: 2

4. Complete the following properties of exponents. Leave answers with positive exponents.

a) $x^m x^n = x^{m+n}$

b) $\frac{x^m}{x^n} = x^{m-n}$

c) $(x^m)^n = x^{mn}$

d) $(xy)^n = x^n y^n$

e) $\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$

f) $x^{-m} = \frac{1}{x^m}$

5. Simplify the following expressions completely and leave all answers with POSITIVE exponents only.

a) $x^{5/12} x^{1/12} = x^{5/12 + 1/12} = x^{6/12} = x^{1/2}$

b) $(-2x^7 y^3 z)(15x^2 y z) = -30x^{7+2} y^{3+1} z^{1+1}$
 $= -30x^9 y^4 z^2$

c) $\frac{4xy^7}{8x^5 y^4} = \frac{y^3}{2x^4}$

d) $\frac{2(2aa^2)^3}{2a^2 a^3} = \frac{2(2^3 a^3 a^6)}{2a^{2+3}} = \frac{2(8a^{3+6})}{2a^5} = \frac{16a^9}{2a^5} = 8a^4$

e) $\left(\frac{26x^2 y^2}{13y^{-4}}\right)^0 = 1$

Recall, $(\text{Anything})^0 = 1$

Anything $\neq 0$

f) $\frac{(x^{-2})^3 (x^4)^2}{(x^{-3})^{-2}} = \frac{x^{-6} x^8}{x^6} = \frac{x^8}{x^6 x^6} = x^{8-6-6} = x^{-4} = \frac{1}{x^4}$

g) $\left(\frac{15x^{-7} y^5}{18xy^{-3}}\right)^{-2} = \left(\frac{18xy^{-3}}{15x^{-7} y^5}\right)^2 = \left(\frac{6x^8}{5y^8}\right)^2$
 $= \left(\frac{6xx^7}{5y^3 y^5}\right)^2 = \frac{36x^{16}}{25y^{16}}$

6. Expand each number from scientific notation to expanded form. Be sure final number is nice and clean with ONLY one decimal point in final answer.

a) $-5.89 \times 10^7 = -5,890,000,000 = \boxed{-589000000}$

b) $1.234 \times 10^{-4} = 0.0001234 = \boxed{0.0001234}$

← make sure to re-write w/ ONLY one decimal.

7. Write each number using scientific notation.

a) $2,380,000 = \boxed{2.38 \times 10^6}$

b) $0.000584 = \boxed{5.84 \times 10^{-4}}$

8. Multiply the following polynomials. Simplify completely and put answers in descending order.

a) $-2xy(3x^2y + 5xy^2 - 6) = \boxed{-6x^3y^2 - 10x^2y^3 + 12xy}$

b) $(2x - 4)(5x + 3) = 10x^2 + 6x - 20x - 12$
 $= \boxed{10x^2 - 14x - 12}$

c) $(3x + 2)(3x - 2) = 9x^2 - 6x + 6x - 4$
 $= \boxed{9x^2 - 4}$

d) $(7x - 6)^2 = (7x - 6)(7x - 6)$
 $= 49x^2 - 42x - 42x + 36$
 $= \boxed{49x^2 - 84x + 36}$

$$\begin{array}{r} 42 \\ +42 \\ \hline 84 \end{array}$$

e) $(x + 5)(x^2 + 2x + 7) = x^3 + 2x^2 + 7x$
 $+ 5x^2 + 10x + 35$
 $= \boxed{x^3 + 7x^2 + 17x + 35}$

$$\begin{array}{r} 127 \\ +27 \\ \hline 154 \end{array} \quad \begin{array}{r} 81 \\ 12 \\ 6 \\ \hline 99 \end{array}$$

f) $(3a^2 - 9a + 4)(3a^2 - 9a + 2) = 9a^4 - 27a^3 + 6a^2$
 $- 27a^3 + 81a^2 - 18a$
 $+ 12a^2 - 36a + 8$
 $= \boxed{9a^4 - 54a^3 + 99a^2 - 54a + 8}$

$$\begin{array}{r} 26 \\ 18 \\ \hline 44 \end{array}$$

9. Divide using LONG DIVISION!

a) $(7x^2 - 12x - 4) \div (x - 2)$

$$= 7x + 2$$

$$\begin{array}{r}
 7x + 2 \\
 \hline
 x - 2 \overline{) 7x^2 - 12x - 4} \\
 \underline{- 7x^2 + 14x} \quad \downarrow \\
 2x - 4 \\
 \underline{- 2x + 4} \\
 0
 \end{array}$$

b) $\frac{6a^2 + 5a + 1}{2a + 3}$

$$= 3a - 2 + \frac{7}{2a + 3}$$

$$\begin{array}{r}
 3a - 2 \\
 \hline
 2a + 3 \overline{) 6a^2 + 5a + 1} \\
 \underline{- 6a^2 + 9a} \quad \downarrow \\
 -4a + 1 \\
 \underline{+ 4a + 6} \\
 7R
 \end{array}$$

10. Factor the polynomials completely. Show some steps and if you are guessing and checking, show check.

a) $20a^4b^3 - 18a^3b^4 + 22a^4b^4 = 2a^3b^3(10a - 9b + 11ab)$

2 Rules!!
① Descending
order

② GCF

b) $\underline{2ax + 6x} - \underline{5a - 15} = 2x(a + 3) - 5(a + 3) = (a + 3)(2x - 5)$

4 terms \nearrow
Factor by Grouping!
 \downarrow

c) $\underline{8x^3 - 12x^2} + \underline{14x - 21} = 4x^2(2x - 3) + 7(2x - 3)$
$$= (2x - 3)(4x^2 + 7)$$

d) $16x^3y - 24x^2y + 28xy - 42y$

$$\begin{aligned}
 &= 2y(8x^3 - 12x^2 + 14x - 21) \\
 &= 2y[4x^2(2x - 3) + 7(2x - 3)] \\
 &= 2y(2x - 3)(4x^2 + 7)
 \end{aligned}$$

11. Factor the polynomial completely. Show some steps and if you are guessing and checking, show check.

a) $7x + x^2 - 8 = x^2 + 7x - 8$

$$\begin{aligned} &= x^2 + 8x - 1x - 8 \\ &= x(x+8) - 1(x+8) \\ &= \boxed{(x+8)(x-1)} \end{aligned}$$

$$\begin{array}{r} -8 \\ 8 \times -1 \\ \hline 7 \end{array}$$

2 Rules !!

① Descending order

② GCF

b) $-28 + 2x^2 + 10x$

$$\begin{aligned} &= 2x^2 + 10x - 28 \\ &= 2(x^2 + 5x - 14) \\ &= 2[x^2 + 7x - 2x - 14] \\ &= 2[x(x+7) - 2(x+7)] \\ &= \boxed{2(x+7)(x-2)} \end{aligned}$$

$$\begin{array}{r} -14 \\ 7 \times -2 \\ \hline 5 \end{array}$$

c) $-2x^3 - 26x^2 + 60x$

$$\begin{aligned} &= -2x(x^2 + 13x - 30) \\ &= -2x[x^2 + 15x - 2x - 30] \\ &= -2x[x(x+15) - 2(x+15)] \\ &= \boxed{-2x(x+15)(x-2)} \end{aligned}$$

$$\begin{array}{r} -30 \\ 15 \times -2 \\ \hline 13 \end{array}$$

d) $x^2 + 9xy + 20y^2$

$$\begin{aligned} &= x^2 + 5xy + 4xy + 20y^2 \\ &= x(x+5y) + 4y(x+5y) \\ &= \boxed{(x+5y)(x+4y)} \end{aligned}$$

$$\begin{array}{r} 20 \\ 5 \times 4 \\ \hline 9 \end{array}$$

$$ax^2 + bx + c$$

12. Factor the polynomial completely.

a) $2y^2 + 7y + 3$

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

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

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

$$\begin{array}{c} a \cdot c \\ 2 \cdot 3 \\ b \\ 6 \quad 1 \\ + \\ 7 \end{array}$$

$$\begin{array}{c} \text{Product} \\ a \cdot c \\ \cdot \\ b \\ \text{Sum} \end{array}$$

b) $6x^2 - 13x + 6$

$$= 6x^2 - 13x + 6$$

$$= 6x^2 - 9x - 4x + 6$$

$$= 3x(2x-3) - 2(2x-3)$$

$$= (2x-3)(3x-2)$$

$$\begin{array}{c} 36 \\ -9 \quad -4 \\ -13 \end{array}$$

c) $-10x^3 + 16x^2 - 10x$

$$= 8x^3 + 16x^2 - 10x$$

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

$$= 2x[4x^2 + 10x - 2x - 5]$$

$$= 2x[2x(2x+5) - 1(2x+5)]$$

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

$$\begin{array}{c} -20 \\ 10 \quad -2 \\ 8 \end{array}$$

d) $3x^2y + 14xy^2 - 5y^3$

$$= y(3x^2 + 14xy - 5y^2)$$

$$= y[3x^2 + 15xy - 1xy - 5y^2]$$

$$= y[3x(x+5y) - 1y(x+5y)]$$

$$= y(x+5y)(3x-y)$$

$$\begin{array}{c} -15 \\ 15 \quad -1 \\ 14 \end{array}$$

Exam 3 is not limited to these examples. All topics covered so far are fair game for the Exam including vocabulary terms. There will be problems very similar to the actual homework problems on the exam. You should study worksheets to practice repetition of problems especially the exponent worksheets.