

Name: KEY

Score: _____ / 100

Student ID: _____

DO NOT OPEN THE EXAM UNTIL YOU ARE TOLD TO DO SO

	1	2	3	4	5	6	7	8	9	10	11	12	Total
✓													
Score													

INSTRUCTIONS FOR STUDENTS

- Questions are on both sides of the paper. This is an 11 question exam (One extra credit problem can be attempted for a total of 12 questions).
- Students have 2 hours and 15 minutes to complete the exam.
- **PLEASE SHOW ALL WORK.** Any unjustified claims will receive no credit. Clearly box your final answer.
- You **MUST** complete 11 problems for credit. In the above table in the row with the ✓, please mark with a ✓ which problems you want to be graded. If you wish to do a 12th problem for extra credit, please write *EC* in the ✓ row for the problem you wish to be counted for extra credit.
- No notes, textbooks, phones, calculators, etc. are allowed for the exam.
- Each of the 11 questions you choose to do will be graded out of 3 points. The score will then be totaled and multiplied by 3 to get a raw score out of 99 points. One point will be given for clearly writing your name on the exam sheet. This will get you to 100 points. If you choose to do a 12th problem for extra credit, the most that will be awarded for that question will be 3 points. So, the highest possible score on this examination is 103 points out of 100.
- The back of the test can be used for scratch work.

GOOD LUCK!

1) Use the rules of exponents to simplify the expression

$$\frac{(r^4 s^3)^4}{r^3 s^9} = \frac{r^{16} s^{12}}{r^3 s^9} = \boxed{r^{13} s^3}$$

2) Use the rules of exponents to simplify the expression, do not use negative exponents:

$$\frac{2^{-1} a^4 b^2}{3^{-2} a^2 b^4} = \frac{3^2 a^4 b^2}{2^1 a^2 b^4} = \frac{9a^2}{2b^2} \quad \text{or} \quad \frac{9}{2} \left(\frac{a}{b}\right)^2$$

$$\frac{9a^2 b^{-2}}{2} = \frac{9a^2}{2b^2} = \frac{9}{2} \left(\frac{a}{b}\right)^2$$

3) Write each of the following in scientific notation:

- a) 23,000
b) 0.062
c) 0.000000567

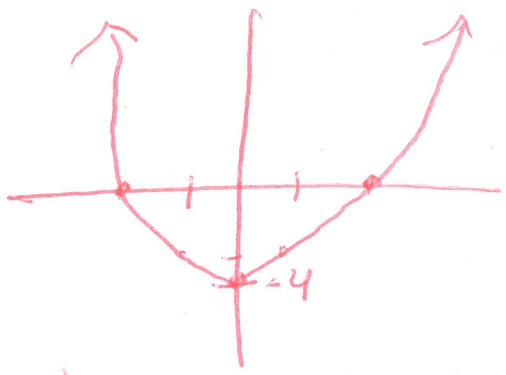
$$a) \underbrace{23,000}_{4 \text{ left}} \Rightarrow \boxed{2.3 \times 10^4}$$

$$b) \underbrace{0.062}_{2 \text{ right}} \Rightarrow \boxed{6.2 \times 10^{-2}}$$

$$c) \underbrace{0.000000567}_{7 \text{ right}} \Rightarrow \boxed{5.67 \times 10^{-7}}$$

4) Graph the following polynomial: $f(x) = x^2 - 4$

X	Y	(x,y)
-2	0	(-2,0)
-1	-3	(-1,-3)
0	-4	(0,-4)
1	-3	(1,-3)
2	0	(2,0)



Graph paper will be provided.

5) Expand the following binomial $(x + 4)^3$

$$\begin{aligned}
 &(x+4)(x+4)(x+4) \\
 &= (x+4)(x^2+8x+16) \\
 &= x^3+8x^2+16x+4x^2+32x+64 \\
 &= \boxed{x^3+12x^2+48x+64}
 \end{aligned}$$

6) Perform the following division using either polynomial division or synthetic division:

$$\frac{6x^3 + 10x^2 + 7x + 2}{3x + 2}$$

~~$\frac{6x^3 + 10x^2 + 7x + 2}{3x + 2}$~~

$$\begin{array}{r}
 2x^2 + 2x + 1 \\
 3x+2 \overline{) 6x^3 + 10x^2 + 7x + 2} \\
 \underline{-(6x^3 + 4x^2)} \quad \downarrow \downarrow \\
 6x^2 + 7x + 2 \\
 \underline{-(6x^2 + 4x)} \quad \downarrow \\
 3x + 2 \\
 \underline{-(3x + 2)} \\
 0
 \end{array}$$

$$\boxed{2x^2 + 2x + 1}$$

~~synthetic division:~~
 you can, but
 rewrite as
 $\frac{1}{3}(6x^3 + 10x^2 + 7x + 2)$
 $x + \frac{2}{3}$
 more difficult.

7) Factor the equation completely: $2x^2 + rx^2 + 5r + 10$

$$= x^2(2+r) + 5(r+2)$$

$$= \boxed{(r+2)(x^2+5)}$$

8) Factor the equation completely: $6a^2 - 30a + 24$

$$= 6(a^2 - 5a + 4)$$

$$= \boxed{6(a-4)(a-1)}$$

9) Solve the following equation for x by factoring the left hand side: $5x^2 + 12x + 7 = 0$
(Do not use quadratic formula)

	$5x + 7$	
x	$5x^2$	$7x$
$+1$	$5x$	7

⇓

$$5x^2 + 7x + 5x + 7$$

$$= 5x^2 + 12x + 7$$

$(5x)x$ only way to get $5x^2$
Factors of $+7$ are $1, 7$ only

so $(5x+7)(x+1) = 0$

$$\boxed{x = -1 \quad x = -\frac{7}{5}}$$

10) Solve the following equation for x by factoring the left hand side: $x^3 - 81x = 0$

$$x^3 - 81x = 0$$

$$x(x^2 - 81) = 0$$

$$x(x+9)(x-9) = 0$$

$x = 0, 9, -9$

11) Solve the following equation for x : $2x^2 - 3x - 14 = 0$

Factors of $2x^2$: x and $2x$

Factors of -14 : -2 and 7 , 2 and -7

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

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

$2x - 7$	$2x^2 - 7x$	$+$	$2x - 14$
----------	-------------	-----	-----------

12) The area of a rectangular slab of foam insulation is 36 m^2 . Find the dimensions of the slab (the length and width):

$$A = lw$$

$$A = 36$$

$$l = 2w + 1$$

$$\Rightarrow A = (2w+1)w$$

$$A = 2w^2 + w = 36$$

$$\Rightarrow 2w^2 + w - 36 = 0$$

$$(w-4)(2w+9) = 0$$

~~$$w = 4, w = -\frac{9}{2}$$~~

$w = 4 \text{ m}$
 $l = 9 \text{ m}$

The length is one more than twice the width

END OF TEST

THIS PAGE IS LEFT BLANK FOR ANY SCRATCH WORK