Math III Honors Unit 3 Test REVIEW **Name:** Key

1. Simplify, write in standard form, and classify: $(2x^4 + 16x^3 + 4) - (-5x^5 + 2x^4 + 8)$

$2x^4 + 16x^3 + 4 + 5x^5 - 2x^4 - 8$

$5x^5 + 16x^3 - 4$ Quintic Trinomial

2. Find the **zeros** of $y = x(2x-3)^2(x^2+4)$

$2x - 3 = 0$ | $x^2 + 4 = 0 \rightarrow \sqrt{x^2} = \sqrt{-4}$

$x = 0$ $x = 3/2$ w/ a mult. of 2 $x = \pm 2i$

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

mult. of 2

$x((x-1)(x^2+6x+9)$

	x^2	$6x$	9
x	x^3	$6x^2$	$9x$
-1	$-x^2$	$-6x$	-9

$x(x^3 - 5x^2 + 3x - 9)$

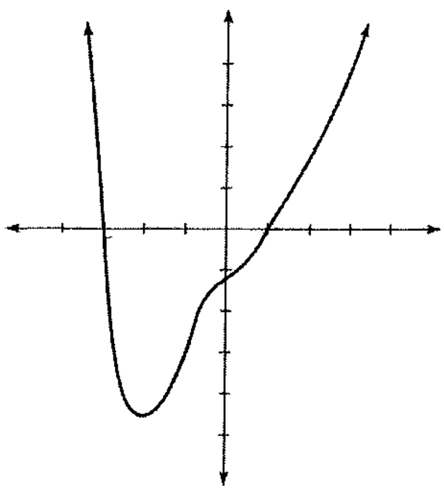
Zeros: $x = 0, -3, -3, 1$

Standard form: $x^4 - 5x^3 + 3x^2 - 9x$

Classify by Degree: Quartic

Classify by # of term(s): polynomial

4. Write a statement that best describes the zeroes of the **quartic** function shown.



4 total solutions

two real & 2 complex (imaginary)

Factor the following for #5-6. Show ALL work.

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

$x(2x^2 + 3x - 9)$

$x(2x-3)(x+3)$

	x	3
$2x$	$2x^2$	$6x$
-3	$-3x$	-9

6. $2x^2 - 32$

$2(x^2 - 16)$ ← diff of perfect squares

$2(x+4)(x-4)$

Solve by factoring for #7-9. Show ALL work and give EXACT answers.

7. $x^4 - 8x^2 = 48$

$x^4 - 8x^2 - 48 = 0$

$(x^2 - 12)(x^2 + 4) = 0$

$\sqrt{x^2} = \sqrt{12}$ $\quad \sqrt{x^2} = \sqrt{-4}$

$\boxed{x = \pm 2\sqrt{3}}$ $\quad \boxed{x = \pm 2i}$

8. $x^3 - 2x^2 + 9x - 18 = 0$

	x	-2
x^2	x^3	$-2x^2$
9	$9x$	-18

$(x^2 + 9)(x - 2) = 0$

$\sqrt{x^2} = \sqrt{-9}$ $\quad \boxed{x = 2}$

$\boxed{x = \pm 3i}$

9. $\sqrt[3]{343a^3} - \sqrt[3]{27} = 0$ SOAP

$7a$ $\quad 3$

$(7a - 3)(49a^2 + 21a + 9)$

$a = 3/7$ $\quad a = 49 \quad b = 21 \quad c = 9$

$= \dfrac{-21 \pm \sqrt{-1323}}{2(49)}$

$= \dfrac{-21 \pm 21\sqrt{-3}}{98}$

$= \dfrac{-3 \pm 3\sqrt{3}\,i}{14}$

10. Factor: $x^2 - y^2$

$(x+y)(x-y)$

11. Determine which binomial is a factor of: $x^3 - x^2 + 4x - 12$.

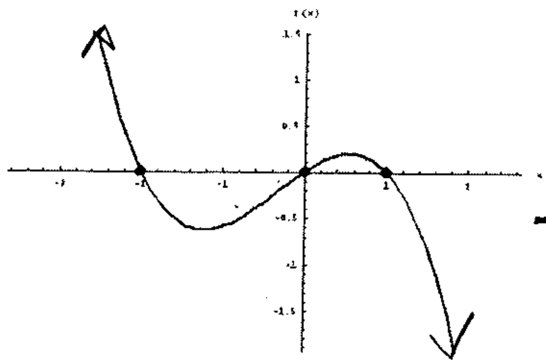
✱ means to graph

a) $(x+2)$ $\quad$ c) $(x-2)$

b) $(x+8)$ $\quad$ d) $(x-8)$

Desmos or TI-84 to find root(s)

12. (a) What are the zeros of the polynomial. (b) Write the equation of the polynomial in standard form.



$X = -2, 0, 1$

$\uparrow \downarrow$ ODD $(-)$

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

$-x(x^2+x-2)$

$\boxed{-(x^3+x^2-2x)}$

13. Write the polynomial in standard form that has zeros of $0, \frac{2}{3}, and\ 4$.

$X=0 \quad X=2/3 \quad x=4$

$x(3x-2)(x-4)$

$x(3x^2-14x+8)$

$\boxed{3x^3-14x^2+8x}$

	$3x$	-2
x	$3x^2$	$-2x$
-4	$-12x$	8

14. Write the polynomial in standard form that has zeros of -2 *and* $3+2i$.

$X=-2$

$(x+2)=0$

$(x+2)$

$x = 3 \pm 2i$

$(x-3)^2 = (\pm 2i)^2$

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

$(x^2-6x+13)=0$

	x^2	$-6x$	13
x	x^3	$-6x^2$	$13x$
2	$2x^2$	$-12x$	26

$\boxed{x^3-4x^2+x+26}$

Divide using synthetic or long division.

15. $(50x^3+10x^2-35x-7) \div (5x-4)$

$$
\begin{array}{r}
10x^2+10x+1 \\
5x-4 \overline{)\,50x^3+10x^2-35x-7} \\
-(50x^3-40x^2) \\
\hline
50x^2-35x \\
-(50x^2-40x) \\
\hline
5x-7 \\
-(5x-4) \\
\hline
-3
\end{array}
$$

$\boxed{10x^2+10x+1-\frac{3}{5x-4}}$

16. $\frac{x^3-13x^2+40x+18}{x-7}$

$$
\begin{array}{r|rrrr}
7 & 1 & -13 & 40 & 18 \\
 & \downarrow & 7 & -42 & -14 \\
\hline
 & 1 & -6 & -2 & 4
\end{array}
$$

$\boxed{x^2-6x-2+\frac{4}{x-7}}$

Cannot box or group or factor

17. Find the EXACT roots using division.

$3x^3 + x^2 - 4 = 0$ Desmos or TI-84

$x = 1$

How many **total** solutions? 3

How many **real-rational** solutions? 1

How many **imaginary** solutions? 2

1	3	1	0	−4
	↓	3	4	4
	3	4	4	∅

$3x^2 + 4x + 4 = 0$

$a = 3 \quad b = 4 \quad c = 4$

$\frac{-4 \pm \sqrt{(4)^2 - 4(3)(4)}}{2(3)} = \frac{-4 \pm \sqrt{-32}}{6}$

$\frac{-4 \pm 4\sqrt{2}i}{6} = \boxed{\frac{-2 \pm 2\sqrt{2}i}{3}}$

18. Expand using Pascal's Triangle: $(2a - b^3)^5$ ← 5th row

18. $32a^5 - 80a^4b^3 + 80a^3b^6 - 40a^2b^9 + 10ab^{12} - b^{15}$

1	5	10	10	5	1
$(2a)^5 = 32a^5$	$(2a)^4 = 16a^4$	$(2a)^3 = 8a^3$	$(2a)^2 = 4a^2$	$(2a)^1 = 2a$	$(2a)^0 = 1$
$(-b^3)^0 = 1$	$(-b^3)^1 = -b^3$	$(-b^3)^2 = b^6$	$(-b^3)^3 = -b^9$	$(-b^3)^4 = b^{12}$	$(-b^3)^5 = -b^{15}$

19. Find the 6th term of $(2x + 3)^8$ using Pascal's Triangle.

19. $108,864x^3$

1	8	28	56	70	56	28	8	1
					$(2x)^3 = 8x^3$			
					$(3)^5 = 243$			

20. A rectangle has the dimensions of $(x - 2)$ and $(-x + 10)$.

a) Write an equation to model the area in factored form of the rectangle.

$f(x) = (x-2)(-x+10)$

b) At what x-value does the maximum area occur?

$\boxed{x = 6}$ $\boxed{\text{2nd}}$ $\boxed{\text{TRACE}}$ #4

Max is $(6, 16)$

c) What is the maximum area of the box?

$\boxed{16 \text{ sq. ft}}$ ← the y-value is the max area

Plug & Check: $(6-2)(-6+10) = 16$!