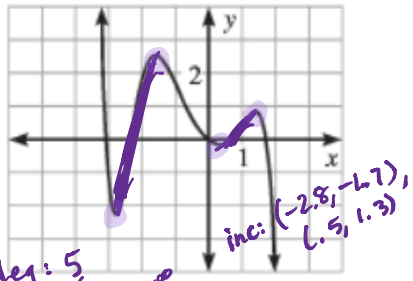
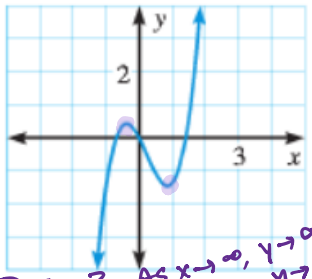
HN Math III: Unit 3 – POLYNOMIAL TEST REVIEW **Name** _____

1. Look at the graphs below and answer the following:

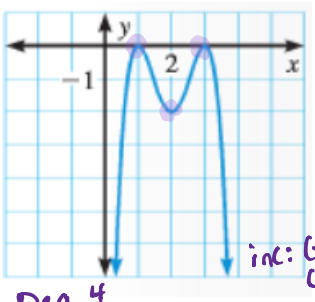
a) What is the degree?
b) How many zeros does the function have?
c) Describe the end behavior
d) State the interval(s) where the function is increasing
e) Circle any extrema



deg: 5
5 zeros
As $x \to \infty$, $y \to -\infty$
$x \to -\infty$, $y \to \infty$
inc: (−2.8, −1.7), (.5, 1.3)



Deg 3. As $x \to \infty$, $y \to \infty$
$x \to -\infty$, $y \to -\infty$
3 zeros.
inc: $(-\infty, -.5)$
$(.8, \infty)$



Deg 4
4 zeros
As $x \to \infty$, $y \to -\infty$
$x \to -\infty$, $y \to \infty$
inc: $(-\infty, 1)$
$(2, 3)$

2. Which polynomial function has zeros at 5, –4, and –3 ?

a. $f(x) = x^3 - 60x^2 + 2x - 23$

b. $f(x) = x^3 + 2x^2 - 23x + 7$

c. $f(x) = x^3 - 17x^2 - 420x + 7$

d. $f(x) = x^3 + 2x^2 - 23x - 60$

3. Find the zeros of $f(x) = (x + 2)^6(x + 3)^4$ and state the multiplicity.

a. –2, multiplicity 6; 4, multiplicity –3

b. –2, multiplicity 6; –3, multiplicity 4

c. 6, multiplicity –2; –3, multiplicity 4

d. 6, multiplicity –2; 4, multiplicity –3

4. Divide $-x^3 + 4x^2 - x - 3$ by $x + 2$.

-2 | -1 4 -1 -3
$\downarrow$ 2 -12 26
-1 6 -13 | 23

a. $-x^2 + 6x - 13$

b. $-x^2 + 2x + 11$, R –29

c. $-x^2 + 2x + 11$

d. $-x^2 + 6x - 13$, R 23

5. Divide $(x^4 + 12x^3 - 91x^2 + 26x + 20) \div (x - 5)$

5 | 1 12 -91 26 20
$\downarrow$ 5 85 -30 -20
1 17 -6 -4 | 0

a. $x^3 + 17x^2 - 6x - 4$

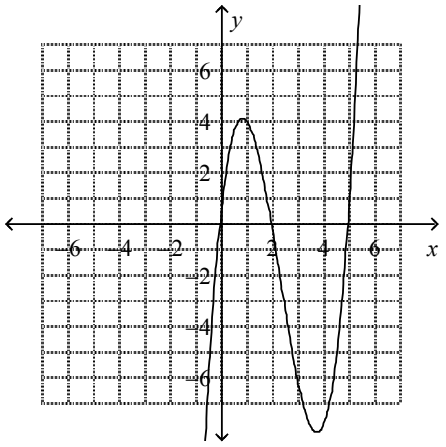
b. $x^3 - 22x^2 - 79x + 34$

c. $x^3 + 12x^2 - 22x + 34$

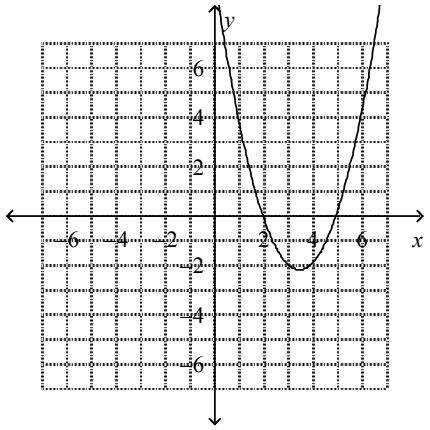
d. $x^3 - 6x^2 - 4x + 17$

6. Find the zeros of $y = x(x - 5)(x - 2)$. Then graph the equation.

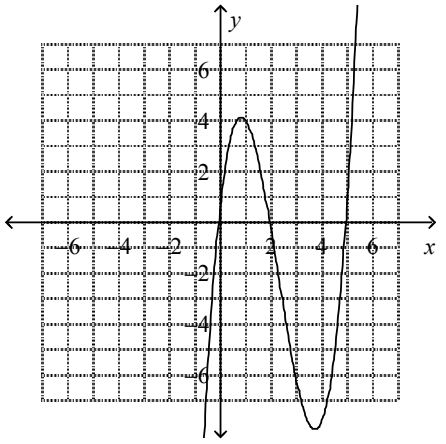
a. 5, 2, –5



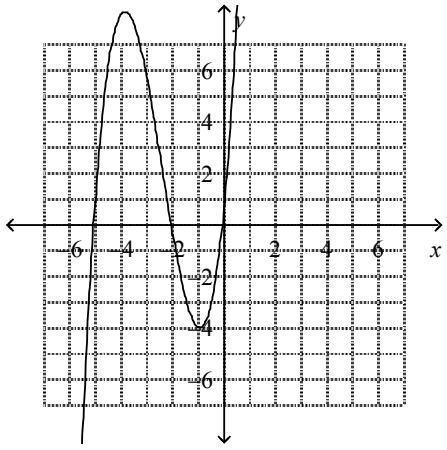
c. 5, 2



b. 0, 5, 2



d. 0, –5, –2



7. Determine which binomial is a factor of $-2x^3 + 14x^2 - 24x + 20$.

a. $x + 5$ b. $x + 20$ c. $x - 24$ d. $x - 5$

Find the roots of the polynomial equation

8. $x^3 - 2x^2 + 10x + 136 = 0$

a. $-3 \pm 5i, -4$

b. $3 \pm 5i, -4$

c. $-3 \pm i, 4$

d. $3 \pm i, 4$

-4 | 1 | −2 | 10 | 136
↓ | | −4 | 24 | −136
| 1 | −6 | 34 | 0

9. $2x^3 + 2x^2 - 19x + 20 = 0$

a. $\frac{3+i}{2}, \frac{3-i}{2}, -4$

b. $\frac{-3+2i}{2}, \frac{-3-2i}{2}, 4$

c. $\frac{-3+i}{2}, \frac{-3-i}{2}, -4$

d. $\frac{3+2i}{2}, \frac{3-2i}{2}, 4$

-4 | 2 | 2 | −19 | 20
↓ | | −8 | 24 | −20
| 2 | −6 | 5 | 0

HN Math III: Unit 3

POLYNOMIAL REVIEW

1. Complete the table below

	Function	Degree	Highest possible # of Max & Mins	End Behavior
A	$f(x) = 3x^5 - x^{10}$	10	9	$x \to \infty$, $y \to -\infty$ $x \to -\infty$, $y \to -\infty$
B	$g(x) = -x^2 + 5x + 3$	2	1	$x \to \infty$, $y \to -\infty$ $x \to -\infty$, $y \to -\infty$
C	$h(x) = 3(x+2)(x-4)$	2	1	$x \to \infty$, $y \to \infty$ $x \to -\infty$, $y \to \infty$
D	$j(x) = -2x^3 - x^2 + 5x - 1$	3	2	$x \to \infty$, $y \to -\infty$ $x \to -\infty$, $y \to \infty$

2. Evaluate the polynomial $f(x) = 3x^5 - x^3 + 6x^2 - x + 1$ for $x = -2$. Explain what your answer represents.

-61

remainder!

3. Find the zeros for the function $f(x) = x^3 + 3x^2 - x - 3$

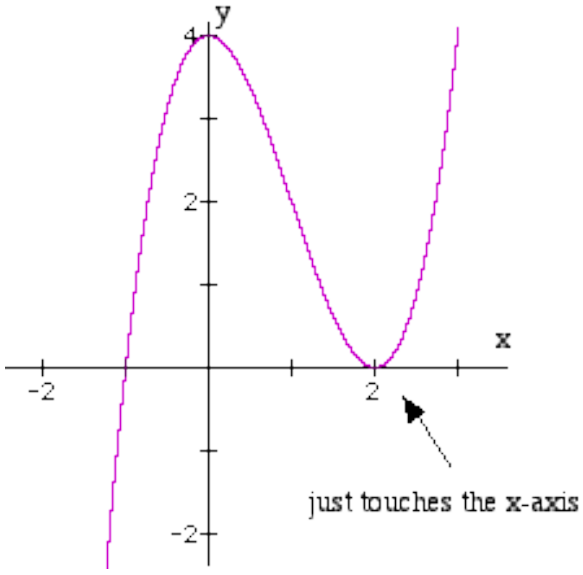
$x = 1$, $x = -1$, $x = -3$

4. Show whether -4 is a zero of $g(x) = x^3 - x^2 - 14x + 24$

$(-4)^3 - (-4)^2 - 14(-4) + 24 = 0$

So yes.

5. Use the graph to answer the following questions



a) Relative maximum: $(0, 4)$

b) Relative minimum: $(2, 0)$

c) Increasing interval: $(-\infty, 0)$ $(2, \infty)$

d) Decreasing interval: $(0, 2)$

e) Domain: $(-\infty, \infty)$

f) Range: $(-\infty, \infty)$

g) End Behavior: $x \to \infty$, $y \to \infty$
$x \to -\infty$, $y \to -\infty$

h) Zeros: $x = -1$, $x = 2$ (mult. 2)

Find all the zeros:

6. $f(x) = 2x^3 + 3x^2 - 39x - 20$ $x=4$

4 | 2 3 −39 −20
↓ 8 44 20
2 11 5 0

$2x^2+11x+5=0$

$x = \frac{-11 \pm \sqrt{121-4(2)(5)}}{4} = \frac{-11 \pm \sqrt{81}}{4} = \frac{-11 \pm 9}{4}$

$x=-\frac{1}{2}$, $x=-5$

7. $f(x) = x^4 + 6x^2 - 7$

$(x^2+7)(x^2-1)=0$

$x=\pm i\sqrt{7}$ $x=\pm 1$

Divide using long division:

8. $x^3 - 3x^2 + 8x - 5 \div (x-1)$

$x^2 - 2x + 6 + \frac{1}{x-1}$

$x-1 \;|\; x^3-3x^2+8x-5$

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

$-2x^2+8x$

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

$6x-5$

$-(6x-6)$

1

9. $4x^3 - 12x^2 - x + 15 \div (2x-3)$

$2x^2-3x-5$

$2x-3 \;|\; 4x^3-12x^2-x+15$

$-(4x^3-6x^2)$

$-6x^2-x$

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

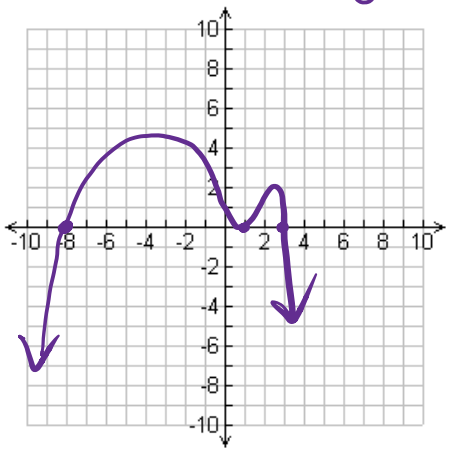
$-10x+15$

$-(-10x+15)$

0

10. Sketch a graph:

$$f(x) = -4(x-1)^2(x-3)(x+8)$$



12. A cement walk of uniform width surrounds a rectangular swimming pool that is 10 m wide and 50 m long. Find the width of the walk if its area is 864 m^2.

$A = l \cdot w$

$864 + 500 = (2x+50)(2x+10)$

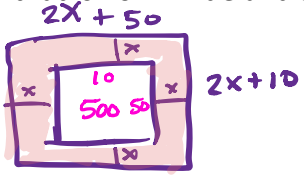
$864 = 4x^2 + 100x + 20x + 500$

$0 = 4x^2 + 120x - 864$

$0 = x^2 + 30x - 216$

$0 = (x+36)(x-6)$

$x=6$



216
9. 24
3. 72
8. 27
4. 54
6. 36

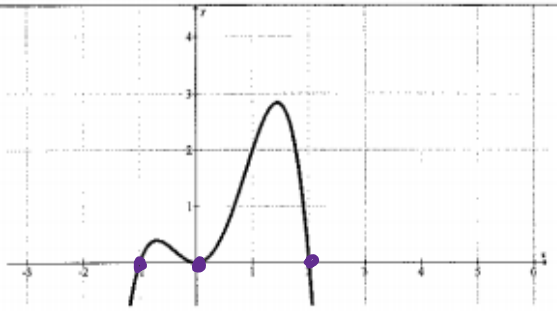
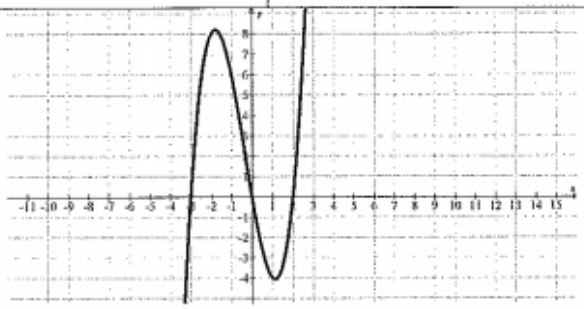
13. The number of eggs, f(x), in a female moth is a function of her abdominal width, x, in millimeters, modeled by $f(x) = 14x^3 - 17x^2 - 16x + 34$. What is the abdominal width when there are 211 eggs?

$211 = 14x^3 - 17x^2 - 16x + 34$

$0 = 14x^3 - 17x^2 - 16x - 177$

$x=3$

Complete the following table

Convert factors to roots	(x + 5) $x = -5$	(x – 3) $x = 3$	(2x + 8) $x = -4$
Convert the roots to factors	X = 7 $(x-7)$	X = -9 $(x+9)$	X = 1/3 $(3x-1)$
Identify the FACTORS of the roots shown in the graph	 Factors: $(x+1)(x\ )^2(x-2)$	 Factors: $(x+3)(x)(x-2)$	
Multiplicity of the functions graphed above	Root x = 0, multiplicity = 2 Root x = -1, multiplicity = 1 Root x = 2, multiplicity = 1		Root x = -3, multiplicity = 1 Root x = -1, multiplicity = 1 Root x = 2, multiplicity = 1
Multiplicity of the each root in the function	$(x-3)^2(x+1)(x-2)^3$ Root: x = 3, multiplicity = 2 X = -1, multiplicity = 1 X = 2, multiplicity = 3		$(x-4)(x)(x+3)^5$ Root: x = 4, multiplicity = 1 X = 0, multiplicity = 1 X = -3, multiplicity = 5

2. The following table gives a ticket price a theater can charge and the profit they can expect to see over the course of a year. Use successive differences to determine the best model to fit this data and then find the model using technology.

quadratic

Ticket Price (dollars)	*Profit (Millions of Dollars)*	
200	3.08	
250	3.52	> .44 > -.2
300	3.76	> .24 > -.18
350	3.82	> .06 > -.18
400	3.70	> -.12 > -.2
450	3.38	> -.32

$y = -.0000374x^2 + .06x - .53$

3. The total number of video cassettes sold from 1995 to 2005 at Bob's store can be modeled by the function $F(x) = 4x^3+14x^2+200x+1560$ and the number of kinds of video cassettes in Bob's store from 1995 to 2005 can be modeled by $G(x) = 2x + 12$, where x is the number of years since 1995. Using division, find the average number of each kind of video cassettes that Bob sold.

$2(x+6)$

$$\begin{array}{r|cccc} -6 & 4 & 14 & 200 & 1560 \\ & \downarrow & -24 & 60 & -1560 \\ \hline & 4 & -10 & 260 & 0 \end{array}$$

$$\frac{4x^2-10x+260}{2} \Rightarrow \boxed{x^2-5x+130}$$

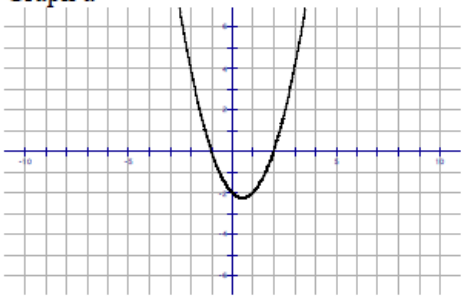
HN Math III: Unit 3

GRAPHING POLYNOMIALS MATCHING REVIEW

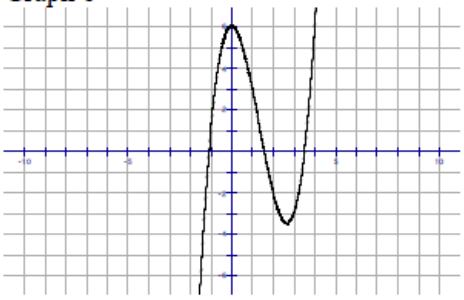
Directions: Complete the chart below with information about the degree, leading coefficient, and end behavior of the function. Then use the graphs included on the next page to match the graph with its corresponding polynomial function.

Polynomial Function	Degree	Leading Coefficient	End Behavior	Circle the matching graph
$f(x)=\frac{1}{2}(x+2)^3$	#1.	#2.	#3.	#4. a b c d e f g h i j
$f(x)=(x+1)(x-2)$	#5.	#6.	#7.	#8. a b c d e f g h i j
$f(x)=x^3-4x^2+6$	#9.	#10.	#11.	#12. a b c d e f g h i j
$f(x)=-(x-2)^4+3$	#13.	#14.	#15.	#16. a b c d e f g h i j
$f(x)=\frac{1}{4}(x+1)^2(x-4)$	#17.	#18.	#19.	#20. a b c d e f g h i j
$f(x)=-(x+6)(x+7)$	#21.	#22.	#23.	#24. a b c d e f g h i j
$f(x)=2(x-3)^3$	#25.	#26.	#27.	#28. a b c d e f g h i j
$f(x)=(x+1)(x-1)(x-3)$	#29.	#30.	#31.	#32. a b c d e f g h i j
$f(x)=-x^4+3x^3+x^2-4x$	#33.	#34.	#35.	#36. a b c d e f g h i j
$f(x)=x^4+x^3-5x^2+4$	#37.	#38.	#39.	#40 a b c d e f g h i j

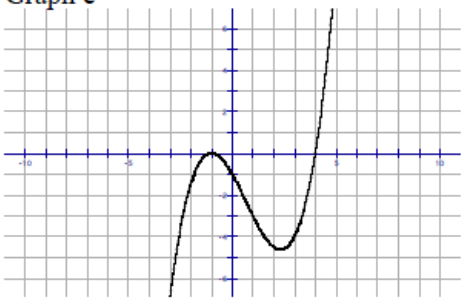
Graph a



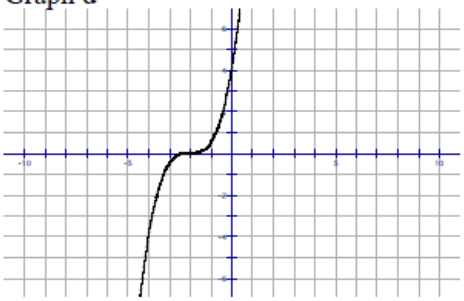
Graph b



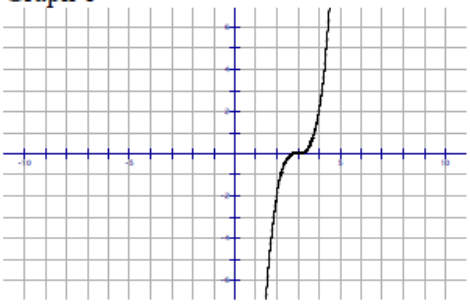
Graph c



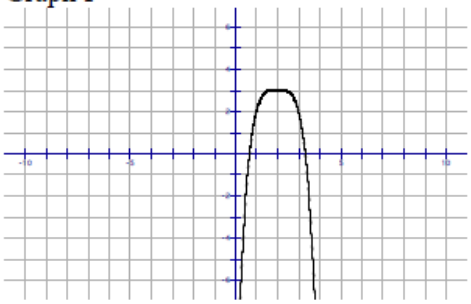
Graph d



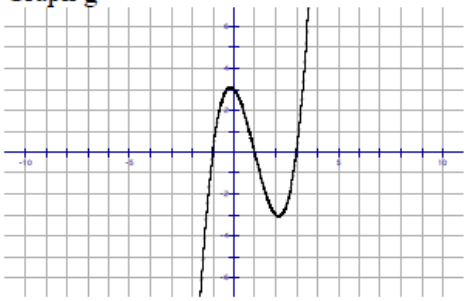
Graph e



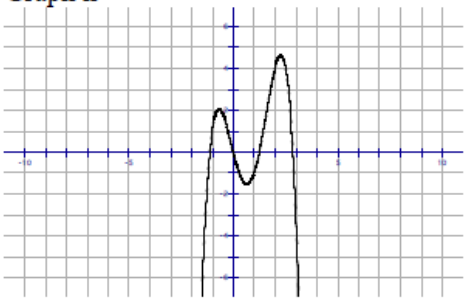
Graph f



Graph g



Graph h



Graph i

Graph j