Review 2.1-2.5 Name _____

Write the following quadratic functions in standard form. $y=a(x-h)^2+k$

1. $f(x)=-3x^2-6x+2$ $a=-3$

$h=\frac{6}{2(-3)}=\frac{6}{-6}=-1$

$k=-3(-1)^2-6(-1)+2=5$

$f(x)=-3(x+1)^2+5$

2. $f(x)=\frac{1}{2}x^2+8x-3$ $a=\frac{1}{2}$

$h=\frac{-8}{2\cdot\frac{1}{2}}=\frac{-8}{1}=-8$

$k=\frac{1}{2}(-8)^2+8(-8)-3=-35$

$f(x)=\frac{1}{2}(x+8)^2-35$

3. $f(x)=4x^2-24x-15$ $a=4$

$h=\frac{24}{2\cdot4}=\frac{24}{8}=3$

$k=4(3)^2-24(3)-15=-51$

$f(x)=4(x-3)^2-51$

4. $f(x)=x^2-7x+2$ $a=1$

$h=\frac{7}{2\cdot1}=\frac{7}{2}$

$k=(\frac{7}{2})^2-7(\frac{7}{2})+2=-\frac{41}{4}$

$f(x)=(x-\frac{7}{2})^2-\frac{41}{4}$

Evaluate each polynomial for the given value of x using synthetic division. Show your work.

5. $f(x)=x^4-5x^3+5x^2+5x-6$

$f(-2)=60$

-2 | 1 −5 5 5 −6
−2 14 −38 66
1 −7 19 −33 60

6. $f(x)=x^3-2x^2-5x+6$

$f(-6)=-252$

-6 | 1 −2 −5 6
−6 48 −258
1 −8 43 −252

Find the quotient and the remainder. Determine if the binomial is a factor of the first polynomial.

7. $f(x)=x^3-12x+16\div(x-2)$

2 | 1 0 −12 16
2 4 −16
1 2 −8 0

$Q(x)=x^2+2x-8$

$R(x)=0$ YES

8. $f(x)=x^3+x^2+x+3\div(x+1)$

-1 | 1 1 1 3
−1 0 −1
1 0 1 2

$Q(x)=x^2+1$

$R(x)=2$ No

Express each function as a product of linear factors.

9. $f(x)=x^3+6x^2-x-6$

1 | 1 6 −1 −6
1 7 6 0

x^2+7x+6

$(x+6)(x+1)$

$f(x)=(x+6)(x+1)(x-1)$

10. $f(x)=2x^3-11x^2-x+30$

2 | 2 −11 −1 30
2 −7 −15 0

$2x^2-7x-15$

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

$f(x)=(2x+3)(x-5)(x-2)$

Write the equation in factored form of a polynomial with the given roots.

11. $3, \frac{1}{3}, -\frac{1}{2}$

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

12. $1dr,\ 1\pm 3i$

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

List the possible rational roots.

13. $f(x)=2x^3-11x^2-x+30$

$\pm\left(1,2,3,5,6,10,15,30,\frac{1}{2},\frac{3}{2},\frac{5}{2},\frac{15}{2}\right)$

14. $f(x)=x^3+6x^2-x-6$

$\pm(1,2,3,6)$

Find the exact zeros of each polynomial below. Use synthetic division when necessary.

15. $f(x)=x^3-4x^2+9x-10$

$2, 1\pm 2i$

	1	−4	9	−10
2	1	−2	5	0

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

$x=\frac{2\pm\sqrt{2^2-4\cdot1\cdot5}}{2\cdot1}$

$x=\frac{2\pm\sqrt{-16}}{2}=\frac{2\pm4i}{2}=1\pm2i$

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

$1, \frac{3\pm\sqrt{13}}{2}$

	1	−4	2	1
1	1	−3	−1	0

$x^2-3x-1=0$

$x=\frac{3\pm\sqrt{3^2-4\cdot1\cdot-1}}{2\cdot1}$

$x=\frac{3\pm\sqrt{13}}{2}$

17. $f(x)=x^3-17x^2+70x-54$

$1, 8\pm\sqrt{10}$

	1	−17	70	−54
1	1	−16	54	0

$x^2-16x+54=0$

$x=\frac{16\pm\sqrt{16^2-4\cdot1\cdot54}}{2\cdot1}=\frac{16\pm\sqrt{40}}{2}=\frac{16\pm2\sqrt{10}}{2}=8\pm\sqrt{10}$

256 − 216 = 40

18. $f(x)=x^3-7x^2+11x+3$

$3, 2\pm\sqrt{5}$

	1	−7	11	3
3	1	−4	−1	0

$x^2-4x-1=0$

$x=\frac{4\pm\sqrt{4^2-4\cdot1\cdot-1}}{2\cdot1}=\frac{4\pm\sqrt{20}}{2}=\frac{4\pm2\sqrt{5}}{2}=2\pm\sqrt{5}$

Perform the indicated operation.

19. $(5+2i)+(6-7i)$

$11-5i$

20. $(8-3i)-(4+i)$

$4-4i$

21. $(1+3i)(2-5i)$

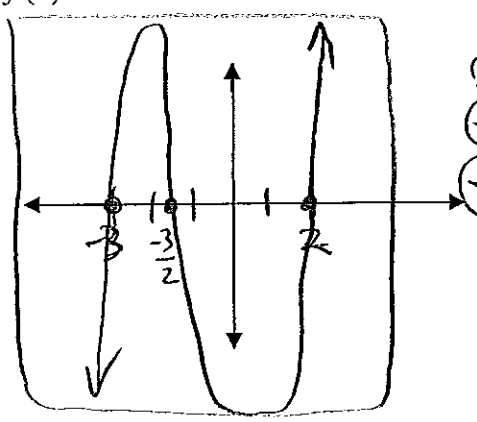
$2-5i+6i-15i^2=17+i$

22. $\frac{3i}{1-4i}\cdot\frac{1+4i}{1+4i}=\frac{3i+12i^2}{1-16i^2}=\frac{-12+3i}{17}$

$\frac{-12}{17}+\frac{3}{17}i$

Find the (a) exact roots of the polynomial, (b) y-intercept, (c) number of actual relative extrema, then sketch the graph. (remember to label all the above on the graph)

23. $f(x)=2x^5-3x^4-19x^3+43x^2+27x-90$



	2	−3	−19	43	27	−90
2	2	1	−17	9	45	0
−3	2	−5	−2	15	0	
−3/2	2	−8	10	0		

$x^2-4x+5=0$

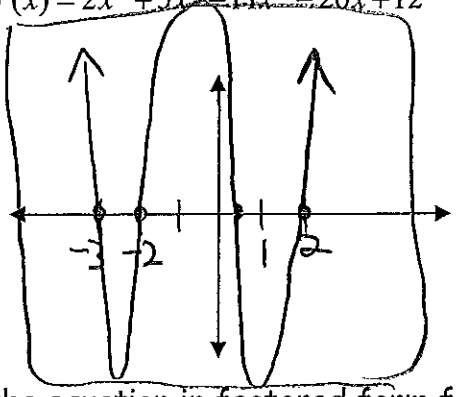
$x=\frac{4\pm\sqrt{4^2-4\cdot1\cdot5}}{2\cdot1}=\frac{4\pm\sqrt{-4}}{2}=\frac{4\pm2i}{2}=2\pm i$

a) $2, -3, -\frac{3}{2}, 2\pm i$

b) $(0,-90)$

c) 4? 2

24. $f(x) = 2x^4 + 5x^3 - 11x^2 - 20x + 12$



	2	5	-11	-20	12
2		4	18	14	-12
	2	9	7	-6	0
-2		-4	-10	6	
	2	5	-3	0	

$2x^2 + 5x - 3 = 0$

$(2x-1)(x+3) = 0$

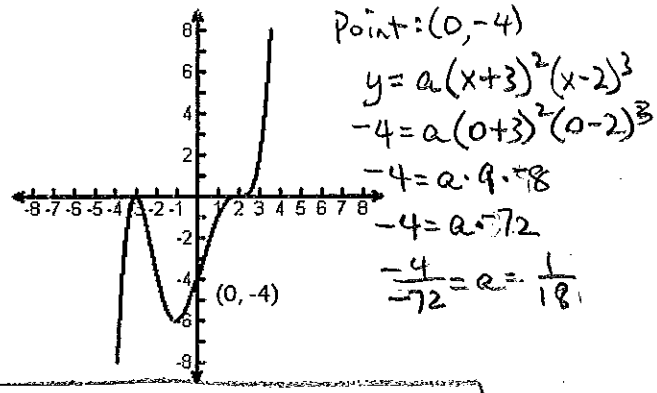
$\frac{1}{2}, -3$

a) $2, -2, \frac{1}{2}, -3$

b) $(0, 12)$

c) 3

Write the equation in factored form for the polynomials graphed below. Be sure to calculate the "a" value for the polynomial. Leave in factored form



Roots: $-3_{(2)}, 2_{(3)}$

Point: $(0, -4)$

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

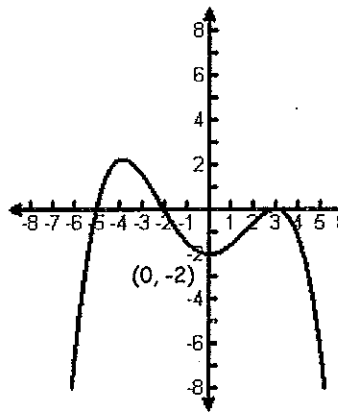
$-4 = a(0+3)^2(0-2)^3$

$-4 = a \cdot 9 \cdot -8$

$-4 = a \cdot -72$

$\frac{-4}{-72} = a = \frac{1}{18}$

25. $y = \frac{1}{18}(x+3)^2(x-2)^3$



Roots: $-5, -2, 3_{(2)}$

Point: $(0, -2)$

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

$-2 = a(0+5)(0+2)(0-3)^2$

$-2 = a \cdot 5 \cdot 2 \cdot 9$

$-2 = a \cdot 90$

$\frac{-2}{90} = a = -\frac{1}{45}$

26. $y = -\frac{1}{45}(x+5)(x+2)(x-3)^2$

Write the quadratic equation (standard form) that has the given vertex and point on the graph.

27. vertex: (5 , 12); point (7, 15)

$y = a(x-5)^2 + 12$

$15 = a(7-5)^2 + 12$

$3 = a \cdot 4$

$3/4 = a$

$y = \frac{3}{4}(x-5)^2 + 12$

28. vertex: (-2 , -2); point (-1, 0)

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

$0 = a(-1+2)^2 - 2$

$2 = a \cdot 1$

$2 = a$

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

29. vertex: (-1 , 4); point (-3, 0)

$y = a(x+1)^2 + 4$

$0 = a(-3+1)^2 + 4$

$-4 = a \cdot 4$

$\frac{-4}{4} = a = -1$

$y = -(x+1)^2 + 4$

30. vertex: (2 , 3); point (0, 2)

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

$2 = a(0-2)^2 + 3$

$-1 = a(4)$

$-\frac{1}{4} = a$

$y = -\frac{1}{4}(x-2)^2 + 3$