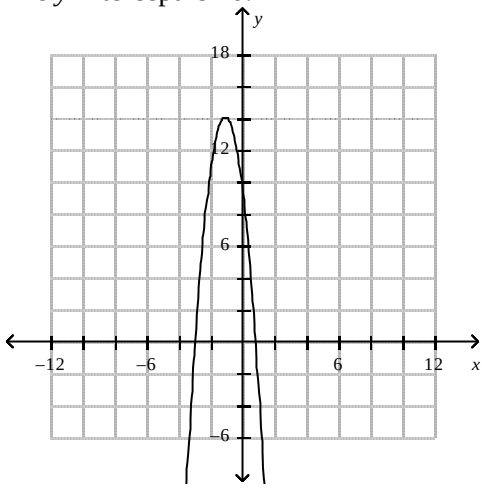
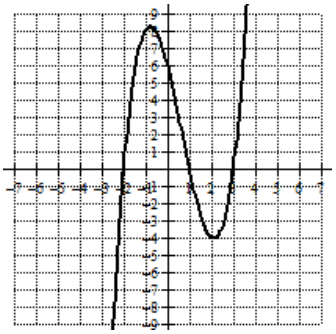
Name: _____

Midterm Review
Answer Section

SHORT ANSWER

1. The parabola opens downward.
   The axis of symmetry is the line $x = -1$.
   The vertex is the point $(-1, 14)$.
   The *y*-intercept is 10.



2. $f(x) = x^2 + 2x - 48$
3. $f(x) = -5(x + 6)^2 - 1$;
   vertex: (–6, –1)
4. $x = -3 + 3i$ or $-3 - 3i$
5. $x = \dfrac{-7 \pm \sqrt{13}}{2}$
6. $x = \frac{1}{8} \pm \frac{\sqrt{79}}{8} i$
7. $f(x) = x^2 - 3x + 6$
8. $-1 - 10i$
9. $36 + 24i$
10. $6a^5 + 6a^4 - 2$
11. $5x^4 - 3x^3 - 25x^2 + 25x - 6$
12. $x - 7 + \frac{-4}{x-2}$
13. $2x + 7 + \frac{-2x+4}{2x^2+3x-2}$
14. yes it is a factor
15. $P(x) = (2x - 1)(x + 4)(x - 5)$
    $= 2x^3 - 3x^2 - 39x + 20$
16. The degree is 4.
    As $x \to -\infty$, $P(x) \to -\infty$ and as $x \to +\infty$, $P(x) \to -\infty$
17. $f(x) = -2(x + 3)(x + 1)(x - 4)$
18. The degree is odd, and the leading coefficient is positive.
19. $f(x) = (x + 2)(2x + 1)(2x - 1)(2x - 3)$
20. $f(x) = 2(x^2 + x - 4x - 4)$
    $= 2x^2 - 6x - 8$
21. $f(x) = 3(x^2 - 8x + 16) + 7$
    $= 3x^2 - 24x + 55$
22. degree 2 because 2nd differences are all the same
23. $(4 - 5i)(8 + i) = 32 + 4i - 40i - 5i^2$
    $= 32 + 4i - 40i - 5(-1)$
    $= (32 + 5) + (4i - 40i)$
    $= 37 - 36i$
24. 
25. $f(x) = \frac{1}{2}(x - 4)(x + 2)(x + 3)$
26. Two possible correct answers $f(x) = x(x + 3)(x - 1)$ and $g(x) = 3x(2x + 6)(4x - 4)$
27. Yes, $x - 1$ is a factor of $x^4 - 3x^3 + 6x^2 - 12x + 8$ because it divides into the polynomial without a remainder.

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28. $x-4\overline{)2x^3-7x^2-19x+60}$

$$\begin{array}{r} 2x^2+x-15 \\ x-4\overline{)2x^3-7x^2-19x+60} \\ \underline{2x^3-8x^2} \\ x^2-19x \\ \underline{x^2-4x} \\ -15x+60 \\ \underline{-15x+60} \\ 0 \end{array}$$

29. $(x-4)(x^2+5x+4)$

30. $f(-8) = (-8)^3 - 7(-8)^2 - 10(-8) + 16$

$f(-8) = 512 - 448 + 80 + 16$

$f(-8) = 160$

$f(-2) = (-2)^3 - 7(-2)^2 - 10(-2) + 16$

$f(-2) = -8 - 28 + 20 + 16$

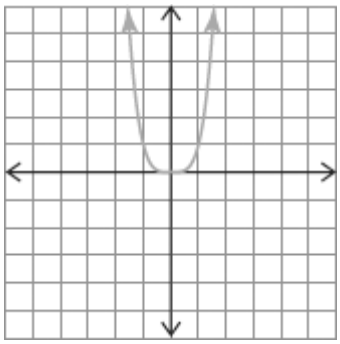
$f(-2) = 0$

$f(1) = (1)^3 - 7(1)^2 - 10(1) + 16$

$f(1) = 1 - 7 - 10 + 16$

$f(1) = 0$

No, the function $g(x)$ is not the factored form of $f(x)$. Since $f(-8) = 160$, $x+8$ is not a factor of $f(x)$ by the Factor Theorem.

31. 

As $x \to \infty$, $f(x) \to \infty$

As $x \to -\infty$, $f(x) \to \infty$

32. The function $g(x)$ has an odd degree.

I know that function $g(x)$ is odd because the graph approaches positive infinity as x approaches negative infinity and the graph approaches negative infinity as x approaches positive infinity. The graph of $g(x)$ shows 3 real zeros, one zero at -1 with a multiplicity of 2 and another zero at 8 with a multiplicity of 1. The function $h(x)$ is even because imaginary zeros are always in pairs, so the function has 4 zeros.

33. $f(x) = 3(x-2)^2 - 4$

34. $f(x) = 3x^2 - 24x + 55$