Precalculus

2.1-2.4 Test Review

Name Key

Period_____ Date_____

Find the vertex.

1. $f(x) = -2x^2 + 12x - 18$ $x = \frac{-12}{2(-2)} = \frac{-12}{-4} = 3$ V: $(3,0)$	2. $f(x) = -2(4x - 12)^2 + 5$ V: $(3,5)$
3. $f(x) = x^2 + 16x + 61$ $x = \frac{-16}{2(1)} = -8$ V: $(-8,-3)$	4. $f(x) = \frac{1}{2}(5x + 10)^2$ V: $(-2,0)$

Write the quadratic equation with the given vertex which passes through the given point.

5. Vertex: $(-2,5)$; Point: $(0,9)$ $y = a(x+2)^2 + 5$ $9 = a(0+2)^2 + 5$ $4 = 4a$ $a = 1$ $y = (x+2)^2 + 5$	6. Vertex: $(-3,-10)$; Point: $(0,8)$ $y = a(x+3)^2 - 10$ $8 = a(0+3)^2 - 10$ $18 = 9a$ $y = 2(x+3)^2 - 10$
7. Vertex: $(1,-2)$; Point: $(-1,14)$ $y = a(x-1)^2 - 2$ $14 = a(-1-1)^2 - 2$ $16 = 4a$ $y = 4(x-1)^2 - 2$	8. Vertex: $(2,3)$; Point: $(0,2)$ $y = a(x-2)^2 + 3$ $2 = a(0-2)^2 + 3$ $-1 = 4a$ $y = -\frac{1}{4}(x-2)^2 + 3$

Find the $x-$ *intercepts*.

9. $f(x) = 21x^2 + 29x - 10$ 3·7 2·5 $0 = (7x-2)(3x+5)$ $(2/7, 0)$ $(-5/3, 0)$	10. $f(x) = -x^2 + 2x + 5$ $x = \frac{-2 \pm \sqrt{4 - 4(-1)(5)}}{2(-1)}$ $x = \frac{-2 \pm \sqrt{24}}{-2} = \frac{-2 \pm 2\sqrt{6}}{-2} = 1 \pm \sqrt{6}$ $(1 \pm \sqrt{6}, 0)$
11. $f(x) = 8x^2 + 34x - 9$ $0 = (4x-1)(2x+9)$ $(1/4, 0)$ $(-9/2, 0)$	12. $f(x) = x^2 + 10x + 14$ $x = \frac{-10 \pm \sqrt{100 - 4(1)(14)}}{2(1)}$ $x = \frac{-10 \pm \sqrt{44}}{2} = \frac{-10 \pm 2\sqrt{11}}{2} = -5 \pm \sqrt{11}$ $(-5 \pm \sqrt{11}, 0)$

13. Determine the left-hand and right-hand end behavior of: $f(x) = x^5 + 3000000000x^2 + 10$

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

14. Determine the end behavior of $f(x) = -3x^{4000} - 6x^2 + 4$

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

15. What is the multiplicity of the zero $x = 5$ in the function $f(x) = x^3(x-5)^4(x-2)^2$

4

16. State the degree of the given polynomial. $f(x) = -3x^2(x-2)^3(x+4)^1(x-1)^4$

10

17. State the maximum number of zeros for the polynomial $f(x) = -3x^6 + x^4 - 2x + 10$

6

18. State the maximum number of turning points for the polynomial $f(x) = 8x^5 + 3x^4 - 6x^2$

4

19. When using synthetic division the remainders from using -2 and 5 as inputs are 1 and -8 respectively. Which of the following would be the best choice to use as input in order to find the zeros of the function?

$f(-2)=1$
$f(5)=-8$ } sign change

a. -6 b. 3 c. 6 d. -10 e. None of these

only number between -2 & 5

20. The following table shows there are at least how many real zeros?

x	$f(x)$
2.1	$-.0006$
2.2	.00059
2.3	.00073
2.4	$-.0007$
2.5	$-.0017$
2.6	.00194
2.7	.01702

3 sign changes

$\boxed{\text{3 zeros}}$

21. Which of the following are true given the following synthetic division?

I. $f(3)=0$ False

II. x-int: $(-3,0)$ TRUE

III. $x+3$ is a factor TRUE

-3	3	2	-10	33
		-9	21	-33
	3	-7	11	0

22. If the polynomial $g(x) = (x+4)^2(x-3)^1(x+1)^1$ is divided by the polynomial $f(x) = x-7$, then what is the degree of the quotient? Degree 4 divided by degree 1

Quotient degree 3

23. Given: $10-2i$
Name its complex conjugate.

$10+2i$

24. Simplify:
$(3\sqrt{-4})^2 \longrightarrow (3\sqrt{-4})(3\sqrt{-4}) =$
$(3\cdot 2i)(3\cdot 2i) = 36i^2$
$= -36$

25. Simplify:
$-4(2+6i)-(2+11i)$
$-8-24i-2-11i =$
$-10-35i$

26. Write the expression in the form $a+bi$
$\frac{2+3i}{6i}\frac{(i)}{(i)} = \frac{2i+3i^2}{6i^2} = \frac{-3+2i}{-6} = \frac{3-2i}{6} = \frac{1}{2}-\frac{1}{3}i$

27. Write the expression in the form $a+bi$
$\frac{5-2i}{i}\frac{(i)}{(i)} = \frac{5i-2i^2}{i^2} = \frac{2+5i}{-1} = -2-5i$

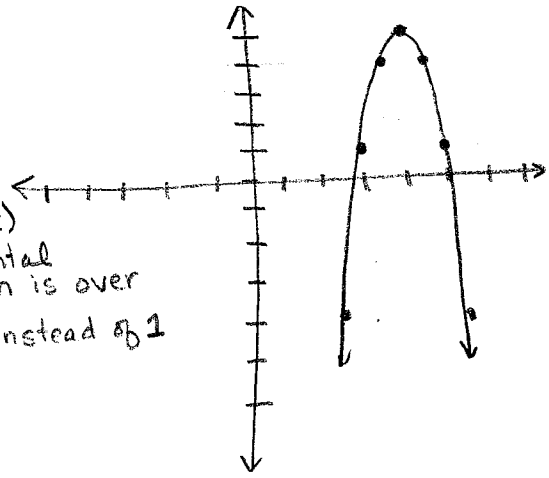
28. Write the expression in the form $a+bi$
$\frac{(1+3i)}{(3-6i)}\frac{(3+6i)}{(3+6i)}$
$\frac{3+6i+9i+18i^2}{9+18i-18i-36i^2} = \frac{-15+15i}{45} = -\frac{1}{3}+\frac{1}{3}i$

29. Write the expression in the form $a+bi$
$\frac{6-i}{3-i}\frac{(3+i)}{(3+i)}$
$\frac{18+6i-3i-i^2}{9+3i-3i-i^2} = \frac{19+3i}{10} = \frac{19}{10}+\frac{3}{10}i$

30. Simplify:
$-5(2+i)^2$
$-5(2+i)(2+i) =$
$-5(4+2i+2i+i^2) =$
$-5(3+4i) =$
$-15-20i$

Graph the following quadratic. (show at least 7 points)

31. $y=-(2x-8)^2+5$

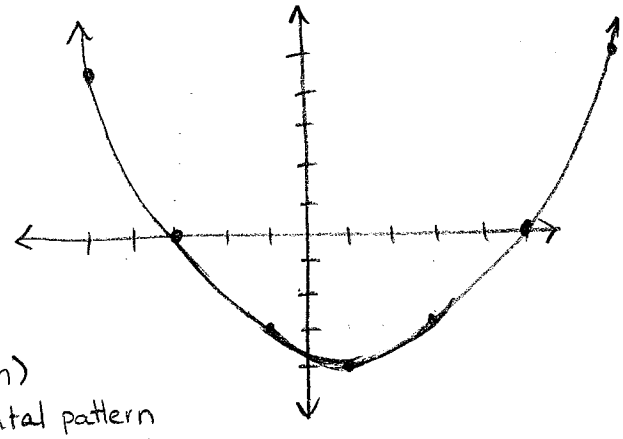


(shrink) horizontal pattern is over ½ instead of 1

Vertex: (4,5)

axis of symmetry: $x=4$

32. $y=[\frac{1}{2}(x-1)]^2-4$



(stretch) horizontal pattern is over 2 instead of 1

Vertex: (1, -4)

axis of symmetry: $x=1$

Write the polynomial with the given zeros.

33. $x = 1, -2, 5$

$(x-1)(x+2)(x-5)$

$(x-1)(x^2-3x-10)$

x^3-3x^2-10x

$-x^2+3x+10$

$f(x)=x^3-4x^2-7x+10$

34. $x = -2, -4, 2, 4$

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

$(x^2-4)(x^2-16)$

$x^4-16x^2-4x^2+64$

$f(x)=x^4-20x^2+64$

35. Divide: $(6x^4+30x^3+26x^2-2x-90)\div(2x^2+4x+6)$

$$
\begin{array}{r}
3x^2+9x-14 \\
2x^2+4x+6\,\overline{)\,6x^4+30x^3+26x^2-2x-90} \\
-6x^4\mp12x^3\mp18x^2 \\
\hline
18x^3+8x^2-2x \\
-18x^3\mp36x^2\mp54x \\
\hline
-28x^2-56x-90 \\
+28x^2-56x+84 \\
\hline
6
\end{array}
$$

$$3x^2+9x-14+\frac{6}{2x^2+4x+6}$$

36. Show that $(x+2)$ and $(x-3)$ are factors of:

$f(x) = x^4 - 4x^3 - 7x^2 + 22x + 24$, then find the remaining zeros by using synthetic division.

$$\begin{array}{r|rrrrr} -2 & 1 & -4 & -7 & 22 & 24 \\ & \downarrow & -2 & 12 & -10 & -24 \\ \hline 3 & 1 & -6 & 5 & 12 & 0 \\ & \downarrow & 3 & -9 & -12 & \\ \hline & 1 & -3 & -4 & 0 & \end{array}$$

← Remainder zero is a factor

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

$(x+4)(x-1) = 0$

$x = -4, 1$

Zeros: $-2, 3, -4, 1$

37. Show that $(x+1)$ and $(x-1)$ are factors of:

$f(x) = x^4 + x^3 + x^2 - x - 2$, then find the remaining zeros by using synthetic division.

$$\begin{array}{r|rrrrr} -1 & 1 & 1 & 1 & -1 & -2 \\ & \downarrow & -1 & 0 & -1 & 2 \\ \hline 1 & 1 & 0 & 1 & -2 & 0 \\ & \downarrow & 1 & 1 & 2 & \\ \hline & 1 & 1 & 2 & 0 & \end{array}$$

← Remainder zero is a factor

$x^2 + x + 2 = 0$

$$x = \frac{-1 \pm \sqrt{1 - 4(1)(2)}}{2(1)} = \frac{-1 \pm \sqrt{-7}}{2} = \frac{-1 \pm i\sqrt{7}}{2}$$

Zeros: $\pm 1, \frac{-1 \pm i\sqrt{7}}{2}$