2017

Algebra 2 Honors
Midterm Exam Review

Name Key
Date 1/19 - 1/24 Block 4A, 1B

Know your parent functions! Be able to recognize the graph of each of the functions we've studied this semester and be able to identify the domain and range of each function.

Chapter 1

In 1 - 2, let $g(x)$ be the indicated transformation of $f(x)$. Write the rule for $g(x)$.

1. $f(x) = -3x + 7$; horizontal compression by a factor of $\frac{3}{4}$ followed by a translation of up 3

$h(x) = f(\frac{4}{3}x) = -3(\frac{4}{3}x) + 7 = -4x + 7$ $\boxed{g(x) = -4x + 10}$

$g(x) = h(x) + 3 = -4x + 7 + 3$

2. $f(x) = -3x + 7$; vertical compression by a factor of $\frac{3}{4}$ followed by a reflection in the y-axis

$h(x) = \frac{3}{4}f(x) = \frac{3}{4}(-3x+7) = -\frac{9}{4}x + \frac{21}{4}$ $\boxed{g(x) = \frac{9}{4}x + \frac{21}{4}}$

$g(x) = h(-x) = -\frac{9}{4}(-x) + \frac{21}{4}$

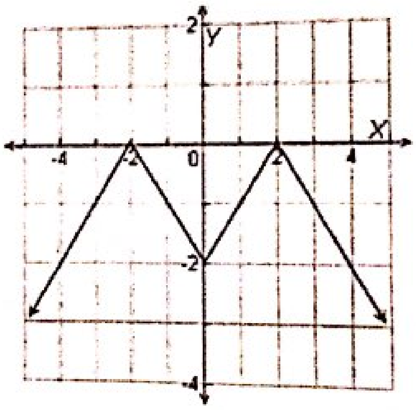
In 3 - 4, use a table to perform each transformation of $y = f(x)$ and graph each new function on the same coordinate plane.

3. horizontal stretch by a factor of 3

x	y
-12	-2
-6	0
0	-2
6	0
12	-2

4. reflection across the x-axis, vertical stretch by a factor of 3 and horizontal translation 1 unit left

x	y
-5	6
-3	0
-1	6
1	0
3	6



x	f(x)
-4	-2
-2	0
0	-2
2	0
4	-2

In 5 - 7, identify the parent function for g from its function rule. Then describe what transformations of the parent function it represents.

5. $g(x) = \sqrt{-2(x-5)}$ square root

reflection in y-axis, horizontal compression by factor of 1/2, shift right 5

6. $g(x) = 4x^2 - 2$ quadratic

vertical stretch by factor of 4, shift down 2

7. $g(x) = -x - \sqrt{2}$ linear

reflection in x-axis, shift down $\sqrt{2}$

Chapter 2

In 8 - 11, use the description to write a quadratic function in the specified form.

8. Write a quadratic function in vertex form that has its vertex at (-3, 2) and passes through the point (4, -1).

$f(x) = a(x-h)^2+k$
$-1 = a(4+3)^2+2$
$-1 = 49a+2$
$49a = -3$
$a = -\frac{3}{49}$
$\boxed{f(x) = -\frac{3}{49}(x+3)^2+2}$

9. The parent function $f(x) = x^2$ is reflected across the x-axis and translated 6 units down to create g. Write g in vertex form.

$\boxed{g(x) = -x^2-6}$

10. Write a quadratic function in standard form that fits the points (-1, 8), (0, 4), and (2, 2).

$f(x) = ax^2+bx+c$ $\boxed{f(x)=x^2-3x+4}$

$a(-1)^2+b(-1)+4=8 \longrightarrow 2(a-b=4)$
$a(2)^2+b(2)+4=2$
$4a+2b=-2$
$2a-2b=8$
$6a=6$
$a=1$
$b=-3$

11. Write a quadratic in vertex form with x-intercepts of -1 and 3 and a leading coefficient of 2.

$f(x) = 2(x+1)(x-3)$
$f(x) = 2x^2-4x-6$
$f(x) = 2(x^2-2x+1)-6-2$
$\boxed{f(x) = 2(x-1)^2-8}$

In 12 - 17, simplify completely. When necessary, write the result in the form $a + bi$.

12. $(4\sqrt{-3})^2 = 4^2(-3)$
-48

13. $(-1 + 2i) + (6 - 9i)$
$5-7i$

14. $(4 + 5i)(2 + i)$
$8+4i+10i+5i^2$
$3+14i$

15. $\frac{(5+i)(2+i)}{(2-i)(2+i)} =$
$\frac{10+7i+i^2}{4-i^2} = \frac{9+7i}{5} \rightarrow \frac{9}{5}+\frac{7}{5}i$

16. $i^{24} + i^{13} - i^{12}$
$1+i-1 = i$

17. $\frac{(3+i\sqrt{2})}{(4+i\sqrt{2})} \cdot \frac{(4-i\sqrt{2})}{(4-i\sqrt{2})}$
$\frac{12-3i\sqrt{2}+4i\sqrt{2}-2i^2}{16-2i^2} = \frac{14+i\sqrt{2}}{18}$
$\frac{7}{9}+\frac{i\sqrt{2}}{18}$

In 18 - 19, identify the vertex, axis of symmetry, y-intercept, x-intercept(s), direction of opening, domain and range for each function. Then, graph each function.

18. $f(x) = (x + 5)^2$

Vertex: (-5, 0)
AOS: x = -5
y-int: (0, 25)
x-int: (-5, 0)
open up
D: $(-\infty, \infty)$
R: $[0, \infty)$

19. $p(x) = \frac{1}{4}x^2 + x + 2$

$\frac{-1}{2(1/4)} = \frac{-1}{1/2} = -2$

Vertex: (-2, 1)
AOS: x = -2
y-int: (0, 2)
x-int: none
open up
D: $(-\infty, \infty)$
R: $[1, \infty)$

$x = \frac{-1 \pm \sqrt{1-4(1/4)(2)}}{2(1/4)}$
non-real solution

In 20 - 23, find the zeros or roots of each function or equation using any of the following methods.

F: Factoring

CTS: Completing the Square

S: Solving by Square Roots

QF: Quadratic Formula

Each method **must be used once.** Indicate which method you used in the blank provided. Remember to show work to support your answer.

20. $f(x) = 3x^2 - 17x + 10$ QF Method used

$x = \frac{17 \pm \sqrt{(-17)^2 - 4(3)(10)}}{6}$

$x = \frac{17 \pm \sqrt{169}}{6} = \frac{17 \pm 13}{6} = \{5, 2/3\}$

21. $30x - 45 = 5x^2$ F Method used

$5x^2 - 30x + 45 = 0$

$x^2 - 6x + 9 = 0$

$(x-3)^2 = 0$ $x = 3$

22. $3x^2 + 42 = 0$ S Method used

$3x^2 = -42$

$x^2 = -14$

$x = \pm i\sqrt{14}$

23. $\frac{3x^2 + 27x = 53}{3}$ CTS Method used

$x^2 + 9x + \frac{81}{4} = \frac{53}{3} + \frac{81}{4}$

$(x + 9/2)^2 = \frac{455}{12}$

$x + \frac{9}{2} = \frac{\pm\sqrt{455}}{2\sqrt{3}}$

$x = -\frac{9}{2} \pm \frac{\sqrt{1365}}{6}$

24. Solve algebraically: $x^2 - 14x + 45 \leq -3$

$x^2 - 14x + 48 \leq 0$

$(x-6)(x-8) = 0$

critical values 6, 8

x − x

6 8

$\boxed{[6, 8]}$

25. Without solving, determine the number and type of solutions for $x^2 - 4x = 8$.

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

Discriminant: $b^2 - 4ac$

$(-4)^2 - 4(1)(-8)$

$16 + 32 = 48$

2 real solutions

Scanned by CamScanner

26. While playing catch with his grandson yesterday, Tim threw a ball as hard as possible into the air. The height h in feet of the ball is given by $h(t) = -16t^2 + 64t + 8$ where t is in seconds.

Find the following:

(a) the maximum height of the ball $h(2) = -16(4) + 64(2) + 8$

$\boxed{72 \text{ feet}}$

(b) the time it took to achieve this height $\frac{-b}{2a} = \frac{-64}{2(-16)} = 2$ seconds

(c) the time it took for the ball to reach the grandson's glove if he caught it at a height of 3 feet. (Round answer to the nearest hundredth.)

$-16t^2 + 64t + 8 = 3$

$-16t^2 + 64t + 5 = 0$

$t = \frac{-64 \pm \sqrt{64^2 - 4(-16)(5)}}{2(-16)} \rightarrow \frac{-64 \pm \sqrt{4416}}{-32}$

$t = -0.0767$ 4.08 sec.

27. A bicyclist is riding at a speed of 20mi/h when she starts down a long hill. The distance d she travels in feet can be modeled by the function $d(t) = 5t^2 + 20t$, where t is the time in seconds.

(a) The hill is 585 ft long. To the nearest second, how long will it take her to reach the bottom?

$5t^2 + 20t = 585$

$5t^2 + 20t - 585 = 0$

$t^2 + 4t - 117 = 0$

$(t + 13)(t - 9) = 0$

$t = \frac{-4 \pm \sqrt{16 - 4(-117)}}{2(1)}$

$t = \frac{-4 \pm \sqrt{484}}{2}$

9 seconds

(b) Suppose the hill were only half as long. To the nearest second, how long will it take her to reach the bottom?

$5t^2 + 20t = 292.5$

$5t^2 + 20t - 292.5 = 0$

$t^2 + 4t - 58.5 = 0$

$t = \frac{-4 \pm \sqrt{16 - 4(1)(-58.5)}}{2}$

$t = \frac{-4 \pm \sqrt{250}}{2} =$ 5.91 seconds

Chapter 3

In 28 - 31, factor completely:

28. $8y^3 - 4y^2 - 50y + 25$

$4y^2(2y - 1) - 25(2y - 1)$

$\boxed{(2y+5)(2y-5)(2y-1)}$

29. $24n^2 + 3n^5$

$3n^2(8 + n^3)$

$\boxed{3n^2(2+n)(4 - 2n + n^2)}$

30. $2x^4 - 2x^3 - 8x^2 + 8x$

$2x[(x^3 - x^2 - 4x + 4)]$

$x^2(x-1) - 4(x-1)$

$2x[(x^2 - 4)(x-1)]$

$\boxed{2x(x+2)(x-2)(x-1)}$

31. $s^6 - 1$

$(s^3 - 1)(s^3 + 1)$

$\boxed{(s-1)(s^2+s+1)(s+1)(s^2-s+1)}$