HN Math III
Unit 1: Functions & Their Inverses Test Review!

Name Key
Date

Please study your NOTES and Quizzes from this Unit before the test next class!!

Section #1: Find the appropriate solution for the assigned function(s)

$f(x) = 3x - 8$ and $g(x) = -2x^2 + 5x - 7$

1. f(0) $= 3(0) - 8 = \boxed{-8}$

2. f(g(2)) $= f(-2(2)^2 + 5(2) - 7) = f(-8 + 10 - 7) = f(-5)$
$= 3(-5) - 8 = -15 - 8 = \boxed{-23}$

3. 2[f(2) – g(1)]
$= 2[(3(2) - 8) - (-2(1)^2 + 5(1) - 7)]$
$= 2[-2 - (-2 + 5 - 7)] = 2[-2 + 4] = \boxed{4}$

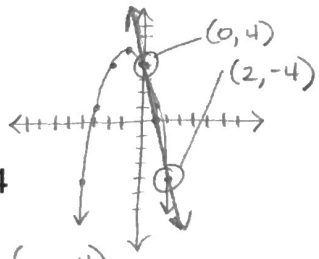
4. f(g(x)) $= f(-2x^2 + 5x - 7)$
$= 3(-2x^2 + 5x - 7) - 8$
$= -6x^2 + 15x - 21 - 8 = \boxed{-6x^2 + 15x - 29}$

5. f(x) – g(x)
$= 3x - 8 - (-2x^2 + 5x - 7)$
$= 3x - 8 + 2x^2 - 5x + 7 = \boxed{2x^2 - 2x - 1}$

6. f(2z) + g(z)
$= 3(2z) - 8 - 2z^2 + 5z - 7$
$= \boxed{-2z^2 + 11z - 15}$

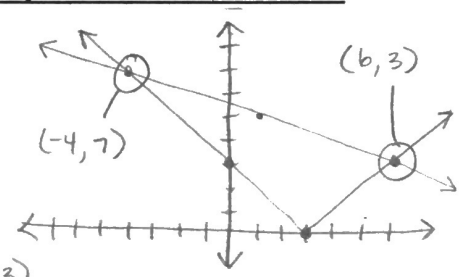
Section #2: Find the solution(s) to the following system. Solve Graphically in your calculator. Include a sketch as your work.

7. $y = -4x + 4$
$y = -x^2 - 2x + 4$



Solutions: (0,4) & (2,-4)

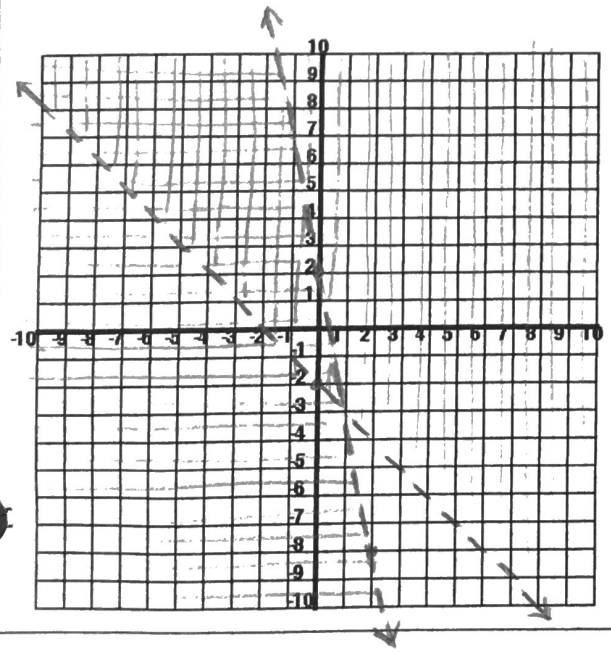
8. $y = |x - 3|$
$y = \frac{-2}{5}x + \frac{27}{5}$



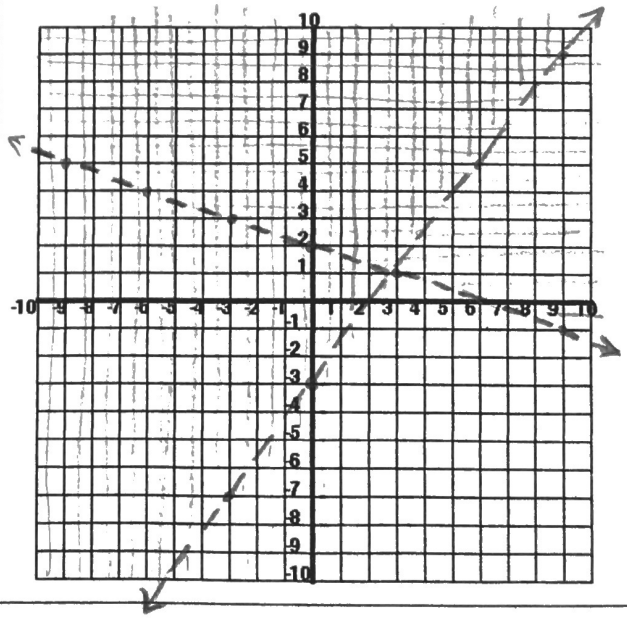
Solutions: (-4,7) & (6,3)

Section #3 Sketch the solution for each inequality.

8. $y > -x - 2$
$y < -5x + 2$



9. $4x - 3y < 9 \longrightarrow y > \frac{4}{3}x - 3$
$x + 3y > 6$
$\hookrightarrow y > -\frac{1}{3}x + 2$

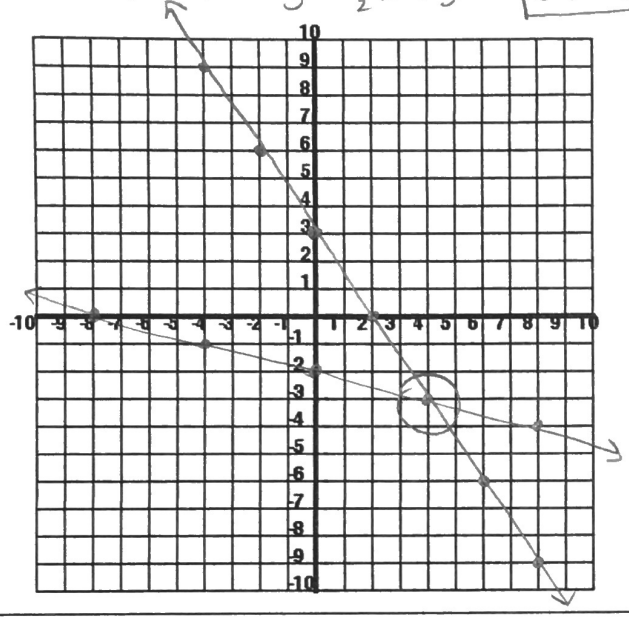


Section #4: Solve the systems of linear equations through graphing, substitution, or elimination. Use method indicted if possible.

METHOD 1: Solve by GRAPHING

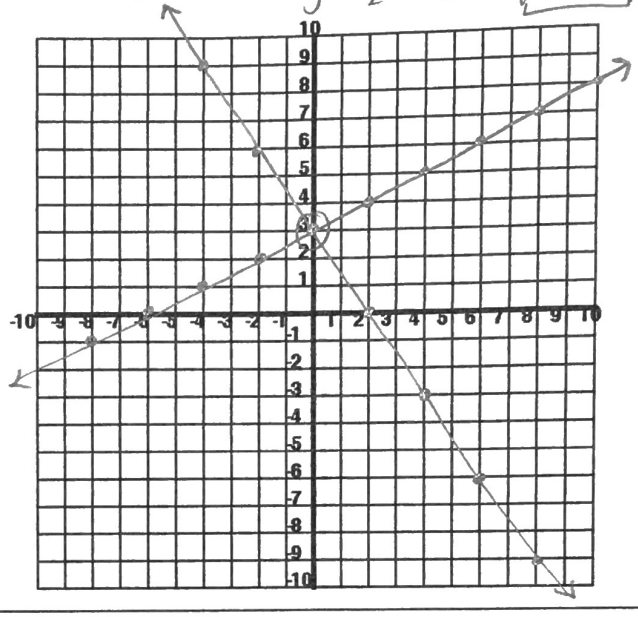
10. $x+4y=-8 \longrightarrow y=-\frac{1}{4}x-2$
$3x+2y=6 \longrightarrow y=-\frac{3}{2}x+3$

(4, -3)



11. $3x+2y=6 \longrightarrow y=-\frac{3}{2}x+3$
$2x-4y=-12 \longrightarrow y=\frac{1}{2}x+3$

(0, 3)



METHOD 2: Elimination

12. $(4x-5y=17) \times 4 \longrightarrow 16x-20y=68$
$(3x+4y=5) \times 5 \longrightarrow 15x+20y=25$
$31x = 93$
$x=3$
$4(3)-5y=17$
$y=-1$
$(3,-1)$

13. $5x-2y=10$
$3x+2y=6$
$8x=16$
$x=2$
$5(2)-2y=10$
$y=0$
$(2,0)$

14. $2y-4x=-6$
$-2y+8x=+12$
$4x=6$
$x=\frac{3}{2}$
$2y-4\left(\frac{3}{2}\right)=-6$
$y=0$
$\left(\frac{3}{2},0\right)$

15. $\left(\frac{1}{2}x+y=3\right) \times 2$
$-x+2y=-6$
$x+2y=6$
$-x+2y=-6$
$4y=0$
$y=0$
$-x+2(0)=-6$
$x=6$
$(6,0)$

16. The equations $8x+4y=28$ and $-9x+9y=36$ represents the amount of money collected from the Stone Creek Movie Theater. If "y" represents the cost of an adult ticket to get into the movie and "x" represents the cost of a child ticket to get into a movie then what is the cost of each adult ticket? Use any method! ☺

$9(8x+4y=28) \longrightarrow 72x+36y=252$
$8(-9x+9y=36) \longrightarrow -72x+72y=288$
$108y=540$
$y=5$

Adult Tix are $5

hod 3: Substitution

17. $x-y=1$
$x+2y=7$ → $x=y+1$

$y+1+2y=7$
$3y+1=7$
$3y=6$
$y=2$
$x=2+1$
$x=3$
$(3,2)$

18. $-5m+9n=21$
$2m+2n=14$ → $2m=14-2n$
$m=7-n$

$-5(7-n)+9n=21$
$-35+5n+9n=21$
$14n=56$
$n=4$
$m=7-4$
$m=3$
$(3,4)$

Section #5: Piece-wise Functions.

19. $f(x)=\begin{cases}2x+1 & x\geq 1\\ x^2+3 & x<1\end{cases}$

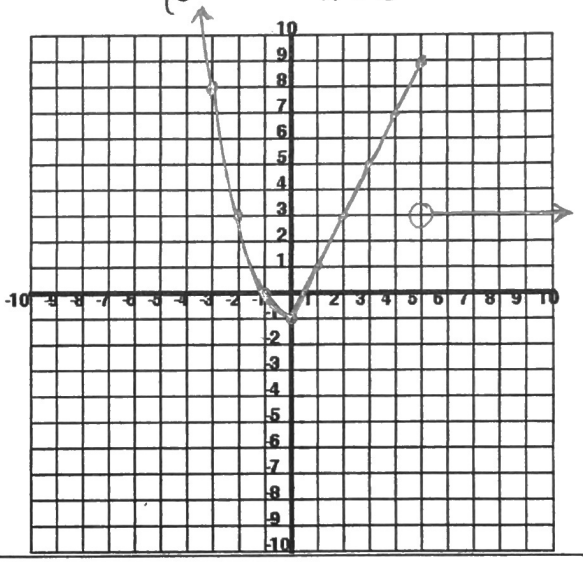
$f(-10)=(-10)^2+3=103$

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

$f(6)=2(6)+1=13$

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

20. $f(x)=\begin{cases}x^2-1 & x\leq 0\\ 2x-1 & 0<x\leq 5\\ 3 & x>5\end{cases}$



21. Looking at #19 find: $2f(1)-3(f(-3)+f(0))$

$2(3)-3((-3)^2+3)+(0^2+3))=6-3(12+3)=6-45=-39$

Section #6: For each equation state the domain and range (using interval notation) then find the inverse and state the domain and range of the inverse. Also, determine if the inverse is a function.

22. $f(x)=5x^3-7$

Domain: $\mathbb{R}$ Range: $\mathbb{R}$

$f^{-1}(x)=\sqrt[3]{\frac{x+7}{5}}$

Domain of $f^{-1}(x)$: $\mathbb{R}$

Range of $f^{-1}(x)$: $\mathbb{R}$

$x=5y^3-7$
$5y^3=x+7$
$y=\sqrt[3]{\frac{x+7}{5}}$

23. $f(x)=-5x-11$

Domain: $\mathbb{R}$ Range: $\mathbb{R}$

$f^{-1}(x)=-\frac{x+11}{5}$

Domain of $f^{-1}(x)$: $\mathbb{R}$

Range of $f^{-1}(x)$: $\mathbb{R}$

$x=-5y-11$
$-5y=x+11$
$y=\frac{x+11}{-5}$

24. $f(x) = 3x^2 - 1$

Domain: $\mathbb{R}$ Range: $[-1, \infty)$

$f^{-1}(x) = \pm\sqrt{\frac{x+1}{3}}$

Domain of $f^{-1}(x)$: $[-1, \infty)$

Range of $f^{-1}(x)$: $\mathbb{R}$

$x = 3y^2 - 1$

$3y^2 = x + 1$

$y = \pm\sqrt{\frac{x+1}{3}}$

25. $f(x) = \sqrt{x-4}$

Domain: $[4, \infty)$ Range: $[0, \infty)$

$f^{-1}(x) = x^2 + 4$

Domain of $f^{-1}(x)$: $[0, \infty)$

Range of $f^{-1}(x)$: $[4, \infty)$

$x = \sqrt{y-4}$

$x^2 = y - 4$

$y = x^2 + 4$

Section #7 Absolute Value Equations & Functions

26. Solve each of the following by graphing and providing a sketch to support your answer.

a. $|x-1| < 4$

a) $-4 < x-1 < 4$

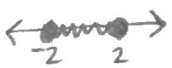
$+1 \quad +1 \quad +1$

$-3 < x < 5$

b. $3 + |y| \leq 5$

b) $|y| \leq 2$

$-2 \leq y \leq 2$



c. $|2+3d| \geq 4$

c) $2+3d \geq 4$ or $2+3d \leq -4$

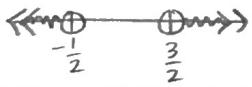
$3d \geq 2$ $3d \leq -6$

$d \geq \frac{2}{3}$ or $d \leq -2$

d. $|2m-1| > 2$

d) $2m-1 > 2$ or $2m-1 < -2$

$m > \frac{3}{2}$ or $m < -\frac{1}{2}$

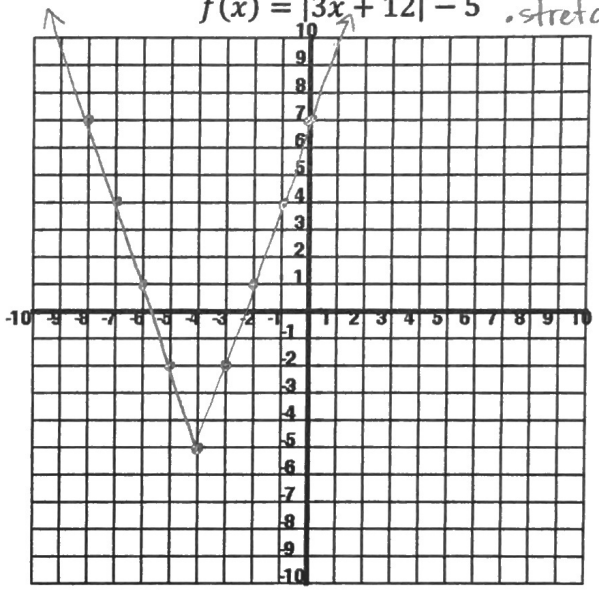


27. Graph the following equation. Then describe the translation of $g(x) = |x|$ to $f(x)$.

$f(x) = |3x + 12| - 5$

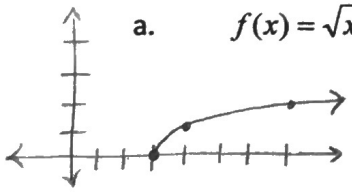
$3|x+4| - 5$

TRANSFORM:
- left 4
- down 5
- stretch by factor of 3



28. Determine whether each of the following is a function. Justify your answer. Find the Domain and Range of each.

a. $f(x) = \sqrt{x-3}$

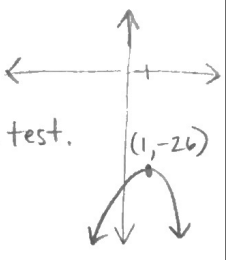


YES! Passes vertical line test.

D: $[3, \infty)$

R: $[0, \infty)$

b. $f(x) = -x^2 + 2x - 27$



YES! Passes vertical line test.

D: $\mathbb{R}$

R: $(-\infty, -26]$

29. You work forty hours a week at a furniture store. You receive a $720 weekly salary, plus a 3% commission on sales over $5000. Assume that you sell enough this week to get the commission. Given the functions f (x) = 0.03x and g(x) = x – 5000, which of (f o g)(x) and (g o f)(x) represents your commission? Also, how much will your salary be if your sales were $14,000? How much will your salary be if your sales were $4999?

$f(x) = 0.03x$

$g(x) = x - 5000$

$f \circ g(x) = 0.03(x - 5000)$

this represents commission — 3% — of $ more than $5000.

$14000 sales: $720 + .03(9000)$

$= \boxed{\$990}$

$4999 sales: $\boxed{\$720}$