Math 129 - Test 2
March 25, 2021

Name key

Score _____

Show all work to receive full credit. Supply explanations where necessary. Label your axes when graphing.

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1. (3 points [7,11]) The equation $(y^2-1)^2 - 10(y^2-1) + 25 = 0$ is "quadratic in form." What substitution will reduce the equation to quadratic? Make the substitution and rewrite the equation, but do not solve.

$u = y^2 - 1 \Rightarrow u^2 - 10u + 25 = 0$

2. (5 points [11]) Solve for r: $2 = \sqrt{3r-12} - 1$

$3 = \sqrt{3r-12}$

$9 = 3r - 12$

$21 = 3r$

$\boxed{r = 7}$

CHECK: $\sqrt{3(7)-12} - 1$

$= \sqrt{21-12} - 1 = \sqrt{9} - 1$

$= 3 - 1 = 2$ ✓

3. (5 points [7,11]) Solve for x: $(6x+4)^{1/3} + 3 = 7$

$(6x+4)^{1/3} = 4$

$6x+4 = 4^3$

$6x+4 = 64$

$6x = 60$

$\boxed{x = 10}$

CHECK:

$[6(10)+4]^{1/3} + 3 = (64)^{1/3} + 3 = 4 + 3 = 7$ ✓

4. (2 points [1,8,9,10]) Find a solution of the equation $2z + 3t = 7$. Write your solution as an ordered pair.

By OBSERVATION,

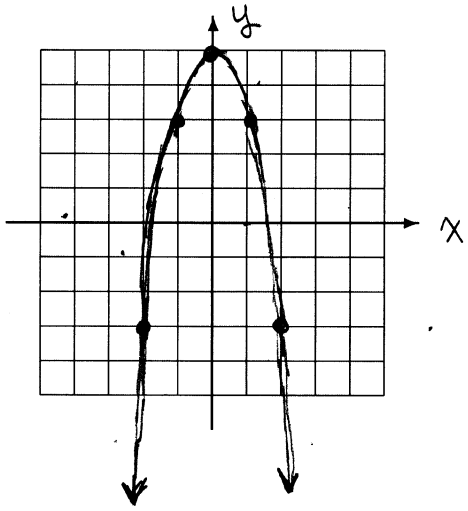
$z = 2$, $t = 1$ IS A SOLUTION:

$2(2) + 3(1) = 4 + 3 = 7$

ORDERED PAIR: $(1, 2)$

5. (6 points [1,9,10]) Make a table that shows five points on the graph of the equation $y = 5 - 2x^2$. Then plot your points and sketch the graph. (Label your axes.)

x	y
-2	-3
-1	3
0	5
1	3
2	-3



6. (3 points [11]) Calculate the distance from the point $P\,(1,-5)$ to the point $Q\,(-2,-3)$. Round your final answer to the nearest hundredth.

$$D = \sqrt{(-2-1)^2 + (-3-(-5))^2}$$

$$= \sqrt{(-3)^2 + (2)^2} = \sqrt{9+4} = \sqrt{13} \approx 3.61$$

7. (6 points [9,10]) A diameter of a circle connects the points $(0,0)$ and $(4,2)$. Find the standard form equation for the circle.

$$\text{Center} = \left(\frac{4+0}{2}, \frac{2+0}{2}\right) = (2,1)$$

$$\text{Radius} = \sqrt{(4-2)^2+(2-1)^2} = \sqrt{5}$$

$$\text{Circle: } (x-2)^2 + (y-1)^2 = 5$$

8. (6 points [3]) Find the x- and y-intercepts of the line described by $-3x + 7y = 6$. Label which is which.

$x=0$:

$7y = 6$

$y = \frac{6}{7}$

$\left(0, \frac{6}{7}\right)$ Y-INTERCEPT

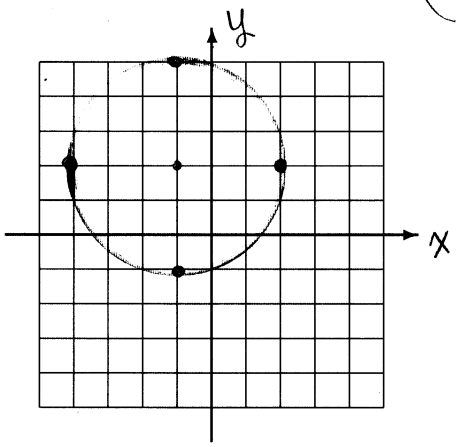
$y=0$:

$-3x = 6$

$x = -2$

$(-2, 0)$ X-INTERCEPT

9. (4 points [9,10]) Sketch the graph of the equation $(x+1)^2 + (y-2)^2 = 9$. Label your axes.



CIRCLE CENTERED AT $(-1, 2)$,

RADIUS = 3

10. (3 points [2,3,4]) Determine an equation of the line that passes through the points $(5, -3)$ and $(5, 7)$.

SAME X $\Rightarrow$ LINE IS VERTICAL: $x = 5$

11. (6 points [2,4]) Carefully sketch the graph of the equation $-3x + 6y = 9$. Label your axes and label the coordinates of two points on your graph.

INTERCEPTS:

$x = 0 \Rightarrow 6y = 9$

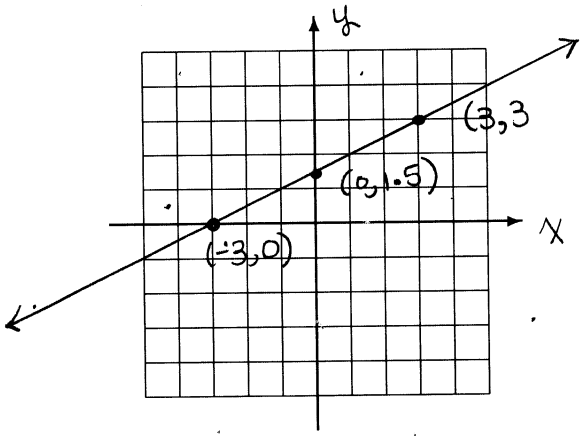
$y = \frac{9}{6} = \frac{3}{2}$

$(0, 1.5)$

$y = 0 \Rightarrow -3x = 9$

$x = -3$

$(-3, 0)$



12. (6 points [2,4]) A line passes through the points $(2, 7)$ and $(-8, 3)$. Find the slope and y-intercept of the line.

$$m = \frac{3-7}{-8-2} = \frac{-4}{-10} = \frac{2}{5}$$

$$y = \frac{2}{5}x + b$$

$$7 = \frac{2}{5}(2) + b$$

$$b = 7 - \frac{4}{5} = \frac{31}{5}$$

SLOPE $= \frac{2}{5}$

Y-INT $= (0, \frac{31}{5})$

13. (3 points [2,4]) A line with slope 5 passes through the point $(6, 1)$. Find another point on the line.

$m = \frac{5}{1} = \frac{\text{RISE}}{\text{RUN}}$

FROM $(6,1)$ RISE 5 AND RUN 1

TO GET $(7,6)$

14. (10 points [2,4]) A line has slope $-3/7$ and passes through $(0, -5)$.

(a) Find an equation of the parallel line that passes through $(7, 1)$. Write your answer in standard form.

$m = -\frac{3}{7}$

Point $(7, 1)$

$y - 1 = -\frac{3}{7}(x - 7)$

$y - 1 = -\frac{3}{7}x + 3$

$y = -\frac{3}{7}x + 4$

$\frac{3}{7}x + y = 4$

(b) Find an equation of the perpendicular line that passes through $(3, -5)$. Write your answer in standard form.

$m = \frac{7}{3}$

Point $(3, -5)$

$y + 5 = \frac{7}{3}(x - 3)$

$y + 5 = \frac{7}{3}x - 7$

$y = \frac{7}{3}x - 12$

$-\frac{7}{3}x + y = -12$

15. (2 points [10]) Carefully explain why this relation is not a function.

$\{(1, 2), (2, 5), (3, 8), (4, 10), (-1, 8), (3, 9)\}$

1ST COORD $x = 3$ IS ASSOCIATED WITH A DIFFERENT 2ND COORDS, $y = 8$ AND $y = 9$.

16. (2 points [10]) Does this table describe a function? How do you know?

x	3	2	1	0	-1	-2
y	3	3	1	1	1	3

EACH X-VALUE IS ASSOCIATED WITH EXACTLY ONE y-VALUE. NO X-VALUES ARE REPEATED.

17. (3 points [1]) Determine the domain of $h(x) = \dfrac{x-3}{(x+2)(x-1)}$.

CANNOT DIVIDE BY ZERO

$\Rightarrow$ $x \neq -2,\ x \neq 1$

$\Rightarrow$ DOMAIN = ALL REAL #'S EXCEPT -2 & 1.

18. (6 points [1]) Let $f(x) = \sqrt{x+5}$.

(a) What is the domain of f?

$x + 5 \geq 0 \Rightarrow x \geq -5 \Rightarrow [-5, \infty)$

(b) Evaluate $f(-6)$.

$f(-6) = \sqrt{-6+5} = \sqrt{-1}$ NOT A REAL #.

(c) Evaluate $f(4)$.

$f(4) = \sqrt{4+5} = \sqrt{9} = 3$

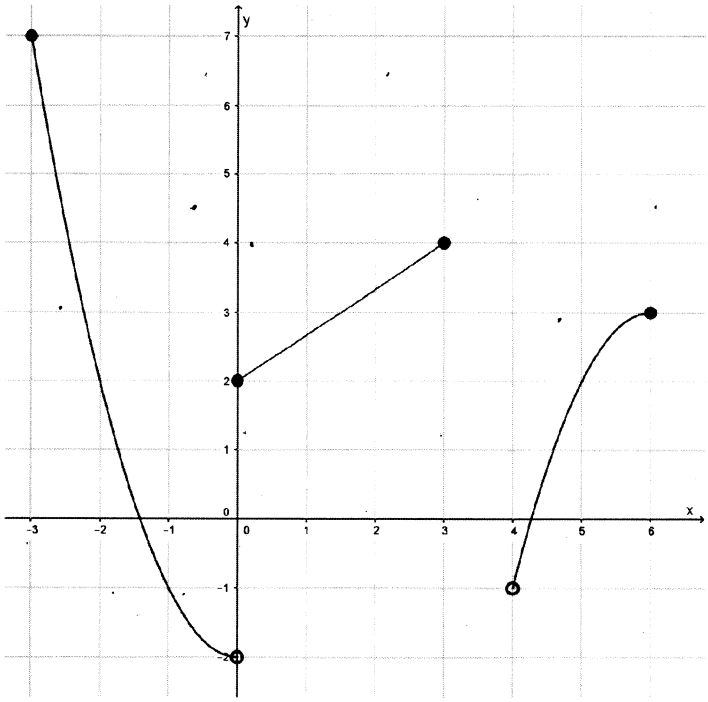
19. (5 points [5]) Let $f(x) = x^2 + x$. Expand and simplify the expression $f(x+h) - f(x)$.

$f(x+h) - f(x) = [(x+h)^2 + (x+h)] - [x^2 + x]$

$= x^2 + 2xh + h^2 + x + h - x^2 - x$

$= 2xh + h^2 + h$ or $h(2x + h + 1)$

20. (14 points [1,10]) The graph of $y = f(x)$ is shown below. Use the graph for each part of this problem.



(a) Is this the graph of a function? How do you know?

YES. THE GRAPH PASSES THE VERTICAL LINE TEST.

(b) What is the domain of f?

$[-3,3] \cup (4,6]$

(c) What is the range of f?

$(-2,7]$

(d) Determine $f(-2)$.

$f(-2) = 2$

(e) Determine $f(0)$.

$f(0) = 2$

(f) Determine $f(4)$.

$f(4)$ IS NOT DEFINED. (NO POINT AT $x=4$)

(g) How many solutions are there for the equation $f(x) = 0$?

THERE ARE TWO: ONE IS BETWEEN -1 & -2

AND ONE IS BETWEEN 4 & 5