Math 129 - Test 2
October 21, 2020

Name key

Score ________

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

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1. (5 points [11]) Solve for y: $\sqrt[3]{5y-1}-4=0$

$$\left(\sqrt[3]{5y-1}\right)^3 = (4)^3$$

$$5y-1 = 64 \Rightarrow 5y = 65 \Rightarrow \boxed{y=13}$$

2. (6 points [7,11]) Solve for x: $x=\sqrt{15-2x}$

$$x^2 = 15-2x$$

$$x^2+2x-15=0$$

$$(x+5)(x-3)=0$$

$$x=-5,\ x=3$$

$x=-5$ CANNOT BE A SOLUTION BECAUSE $\sqrt{\cdot} \neq$ NEG.

$\boxed{x=3}$ CHECKS OUT.

3. (3 points [7,11]) The equation $w^4-36w^2+35=0$ is "quadratic in form." What substitution will reduce the equation to quadratic? Make the substitution and rewrite the equation, but do not solve.

$$w^4-36w^2+35=0$$

$$\boxed{u=w^2 \Rightarrow u^2-36u+35=0}$$

4. (3 points [11]) Calculate the distance between the points $E = (2, -1)$ and $B = (7, -9)$. Round your final answer to the nearest hundredth.

$$D = \sqrt{(7-2)^2 + (-9-(-1))^2}$$

$$= \sqrt{(5)^2 + (-8)^2} = \sqrt{25+64} = \sqrt{89}$$

$$\approx \boxed{9.43}$$

5. (3 points [11]) A line segment extends from the point $(1, -4)$ to the point $(5, 2)$. Find the coordinates of the midpoint of the segment.

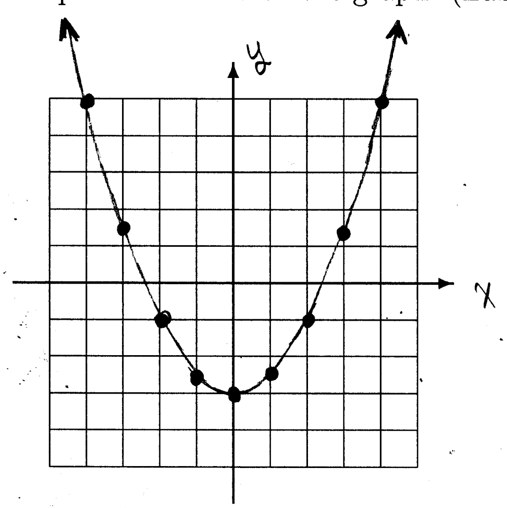
$$\text{Midpoint} = \left(\frac{1+5}{2}, \frac{-4+2}{2}\right)$$

$$= \left(\frac{6}{2}, \frac{-2}{2}\right) = \boxed{(3,-1)}$$

6. (6 points [1,9,10]) Make a table that shows five points on the graph of the equation $y = \frac{1}{2}x^2 - 3$. Then plot your points and sketch the graph. (Label your axes.)

x	y
0	-3
1	-2.5
-1	-2.5
2	-1
-2	-1
±3	1.5
±4	5

Some additional points for a better graph.



7. (4 points [9,10]) Find the standard form equation of the circle that has center $(-3,1)$ and passes through $(6,-4)$.

$(h,k) = (-3,1)$ $\longrightarrow$ $\boxed{(x+3)^2+(y-1)^2=106}$

$r =$ DISTANCE FROM $(-3,1)$ TO $(6,-4)$

$= \sqrt{(-3-6)^2+(1-(-4))^2} = \sqrt{81+25} = \sqrt{106} \Rightarrow r^2 = 106$

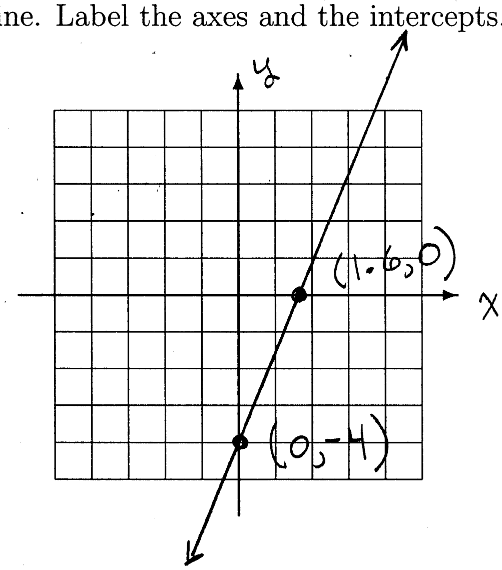
8. (6 points [3]) Find the x- and y-intercepts of the line described by $5x - 2y = 8$. Then sketch the graph of the line. Label the axes and the intercepts.

X-INTERCEPT:

$y = 0$

$5x = 8$

$x = \frac{8}{5} = 1.6$



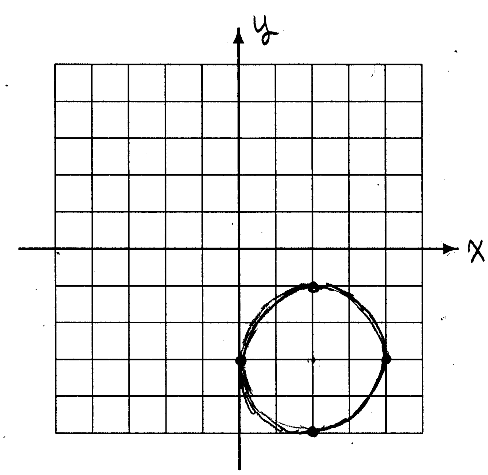
y-INTERCEPT:

$x = 0$

$-2y = 8$

$y = -4$

9. (4 points [9,10]) Sketch the graph of the equation $(x-2)^2 + (y+3)^2 = 4$. Label your axes.



CIRCLE CENTERED AT $(2,-3)$ WITH RADIUS 2.

10. (6 points [2,4]) Find an equation of the line that passes through the points $(3, 4)$ and $(8, -3)$. Write your final answer in slope-intercept form.

$$m = \frac{\Delta y}{\Delta x} = \frac{4-(-3)}{3-8} = \frac{7}{-5}$$

$$\boxed{y = -\frac{7}{5}x + \frac{41}{5}}$$

$$y - 4 = -\frac{7}{5}(x-3) \Rightarrow y = -\frac{7}{5}x + \frac{21}{5} + 4$$

11. (3 points [2,4]) A line is described by the equation $y + 2 = -\frac{3}{5}(x - 1)$. Find the slope of the line and a point on the line.

THE EQUATION IS IN POINT-SLOPE FORM.

WE CAN READ THE SLOPE AND A POINT.

$$\boxed{m = -\frac{3}{5}, \quad \text{POINT} = (1, -2)}$$

12. (10 points [2,4]) Consider the line described by the equation $7x + 5y = 5$.

(a) Find an equation of the line that is parallel to the given line and passes through $(5, -5)$. Write your answer in standard form.

$$7x + 5y = 5$$
$$5y = -7x + 5$$
$$y = -\frac{7}{5}x + 1$$

$$m = -\frac{7}{5} \qquad m_{\parallel} = -\frac{7}{5} \qquad \text{POINT } (5, -5)$$

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

$$\boxed{\frac{7}{5}x + y = 2}$$

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

$$m_{\perp} = \frac{5}{7} \qquad \text{POINT } (5, -5)$$

$$y + 5 = \frac{5}{7}(x - 5)$$
$$y + 5 = \frac{5}{7}x - \frac{25}{7}$$

$$-\frac{5}{7}x + y = -\frac{25}{7} - \frac{35}{7}$$

$$\boxed{-\frac{5}{7}x + y = -\frac{60}{7}}$$

13. (4 points [2,3,4]) Determine equations of the horizontal and vertical lines that pass through $(13, -17)$. Label which is which.

VERTICAL : $X = 13$.

HORIZONTAL : $y = -17$

14. (6 points [2,4]) A line is described by the equation $5x + 2y = 6$. Write the equation in slope-intercept form. Then graph the line, and state the coordinates of two points on your line. (Label your axes.)

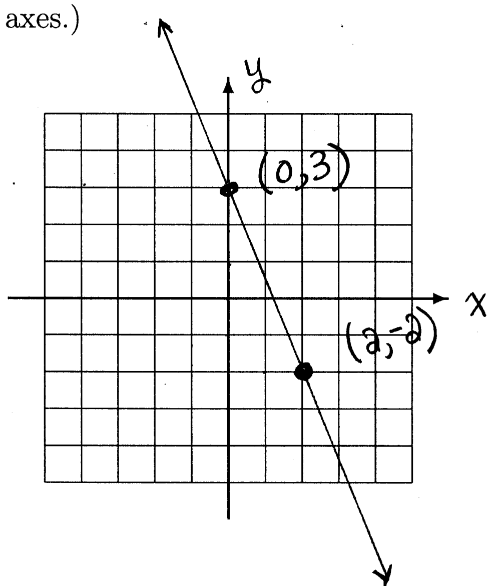
$5x + 2y = 6$

$2y = -5x + 6$

$\boxed{y = -\frac{5}{2}x + 3}$

$-\frac{5}{2} = \frac{\text{RISE}}{\text{RUN}}$

DOWN 5/RIGHT 2



15. (3 points [10]) Three relations are shown below. Circle all that are NOT functions. Then write a sentence explaining why you made your choice(s).

(a) $\{(100, 100)\}$

(b) $\{(x, y) : y \text{ is a real number and } x = 5\}$ ← X=5 IS REPEATED WITH EVERY y-COORD.

(c) $\{(1, 2), (2, 1), (3, 1), (1, 3)\}$

X=1 IS REPEATED WITH 2 y-COORDS

b & C ARE NOT FUNCTIONS BECAUSE SOME X-COORDINATES HAVE MORE THAN ONE y-COORD.

16. (6 points [1]) Let $f(x) = \sqrt{6 - 3x}$.

(a) What is the domain of f?

$6 - 3x \geq 0 \Rightarrow 6 \geq 3x \Rightarrow 2 \geq x$

$x \leq 2$ or $(-\infty, 2]$

(b) Evaluate $f(-10)$.

$f(-10) = \sqrt{6 - 3(-10)} = \sqrt{36} = 6$

(c) Evaluate $f(\frac{2}{3})$.

$f\left(\frac{2}{3}\right) = \sqrt{6 - 3\left(\frac{2}{3}\right)} = \sqrt{6 - 2} = \sqrt{4} = 2$

17. (3 points [1]) Determine the domain of $h(x) = \dfrac{x - 3}{x^2 - 12x + 27}$.

WE CANNOT HAVE

$x^2 - 12x + 27 = 0$

$(x - 3)(x - 9) = 0$

$x = 3, \; x = 9$

DOMAIN: ALL REAL #'s EXCEPT 3 OR 9.

$(-\infty, 3) \cup (3, 9) \cup (9, \infty)$

18. (5 points [5]) Let $f(x) = x^2 - 3x$. Expand and simplify the expression $f(x+5) - f(x)$.

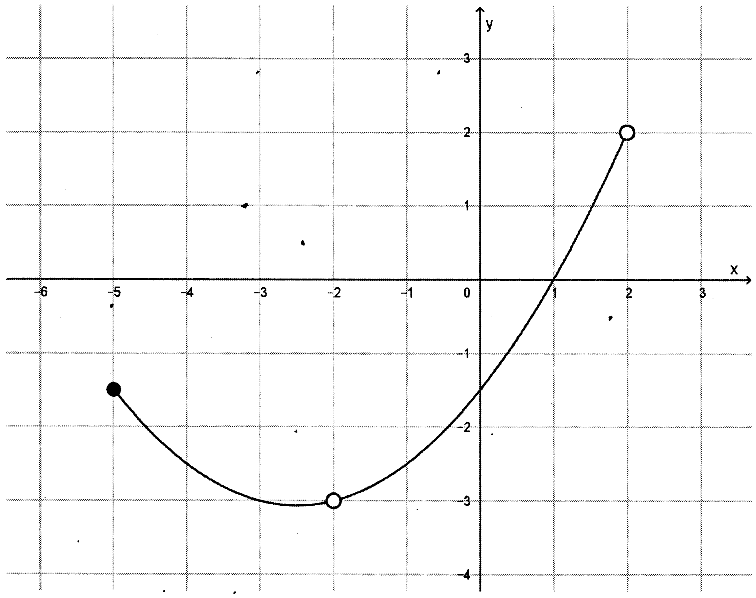
$f(x+5) - f(x) = \left[(x+5)^2 - 3(x+5)\right] - \left[x^2 - 3x\right]$

$= \left[x^2 + 10x + 25 - 3x - 15\right] - \left[x^2 - 3x\right]$

$= \cancel{x^2} + 10x + 25 \cancel{- 3x} - 15 \cancel{- x^2} \cancel{+ 3x}$

$= 10x + 10$

19. (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?

$[-5,-2) \cup (-2,2)$

(c) What is the range of f?

Approximately $[-3, 2)$

(d) Determine $f(-5)$.

$\approx \boxed{-1.5}$

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

NOT DEFINED

(f) Determine $f(0)$.

$\approx \boxed{-1.5}$

(g) How many solutions are there for the equation $f(x) = -2$?

2. THERE ARE EXACTLY TWO PLACES THE GRAPH CROSSES THE LINE $y=-2$