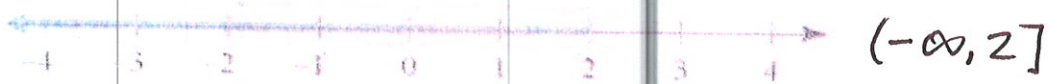


KEY

1. Translate the following graphs or expressions into appropriate interval notation.



a.

- b. t is between -2 and 8, including 8 but not -2. $(-2, 8]$

2. Give an example of a cubic function shifted 3 units right and 2 units up and is narrower than $y = x^3$.

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

3. If $(4, 1)$ is a point on the graph of $f(x)$, which point must be on the graph of $y = 2f(-x)$? $(-4, 2)$

4. Given $f(x) = 4e^{2x+11} - 10$, find two functions $f(x)$ and $g(x)$ such that $(f \circ g)(x) = h(x)$.

$$g(x) = 2x+11 \quad f(x) = 4e^x - 10 \quad (\text{there are other possible answers})$$

5. Sketch the left side of the graph to show a function with y-axis symmetry.

6. Consider the function $f(x) = -x^2 + 3x - 11$. Find an expression or the difference quotient $\frac{f(x+h)-f(x)}{h}$.

Simplify completely. $-2x - h + 3$

7. Suppose that $f(x) = x^2 - 1$, $g(x) = \sqrt{2-x}$. Which of the following is the value of $(fg)(0)$?

- a. 0
b. 2
c. $\sqrt{2}$
d. $-\sqrt{2}$

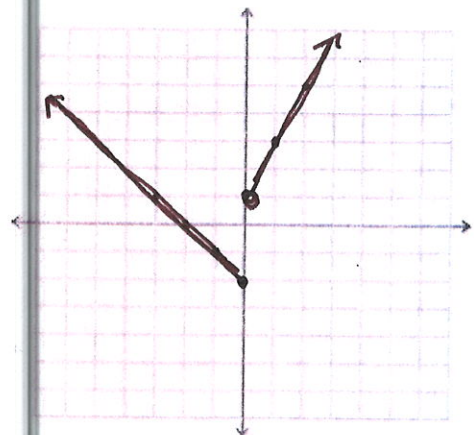
8. Check for symmetry: x-axis, y-axis, origin.

a. $x^2 - xy + y^2 = 4$ *origin*

b. $x = y^2 - 2$ *x-axis symmetry*

9. Consider the piecewise function $f(x) = \begin{cases} 2x+1, & x > 0 \\ -x-2, & x \leq 0 \end{cases}$ find:

- a. $f(0)$ -2
b. $f(2)$ 5
c. X-intercept(s) $x = -2$
d. Y-intercept $y = -2$
e. Graph the function
f. Domain $(-\infty, \infty)$
g. Range $[-2, \infty)$



10. Suppose that $s(t) = \sqrt{3-t^2}$, $u(t) = \frac{t}{t-4}$.

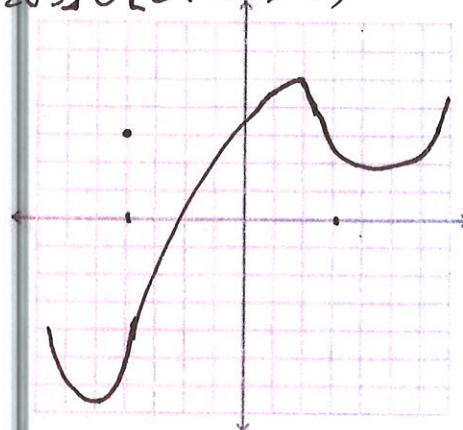
a. Find $(s \circ u)(t) = \sqrt{2(t^2 - 12t + 24)}$

b. Write the domain in proper set notation. $(-\infty, 6-2\sqrt{3}] \cup [6+2\sqrt{3}, \infty)$

11. Let f be a function such that $f(2) \geq f(x)$ for all x in $(-4, 3)$.

a. Does f represent a relative min or max? Explain.

b. Sketch a possible graph of f that follows your explanation.



12. Does the equation $x = y^3 - 4y$ represent a function?

no

13. Find the domain of $f(x) = \frac{x-1}{\sqrt[3]{x+1}}$. $(-\infty, -1) \cup (-1, \infty)$

14. Consider the graph to the right.

a. Identify coordinates of any relative maxima or minima.

b. On what intervals is f increasing?

$(-\infty, -1.155) \cup (1.155, \infty)$

c. On what intervals is f decreasing?

$(-1.155, 1.155)$

15. A department store marks up the price of a power drill by 75% of the price of the manufacturer. The price, $P(x)$, in dollars, to a customer after a 6% sales tax is $P(x) = (x + 0.75x) + 0.06(x + 0.75x)$.

a. Simplify completely.

$P(x) = 1.855x$

b. Evaluate $P(97)$ and interpret the meaning in the context of the problem.

$\$179.94$ if the manufacturer charges $\$97$, the retailer will sell to customer w/ tax for 179.94.

16. Which of the following statements is true?

a. A function h is even if $f(-x) = -f(x)$

b. A function h is odd if $-f(-x) = f(x)$

c. A function h is even if $f(x) = f(x^2)$

d. A function h is even if $f(x) = f(2x)$

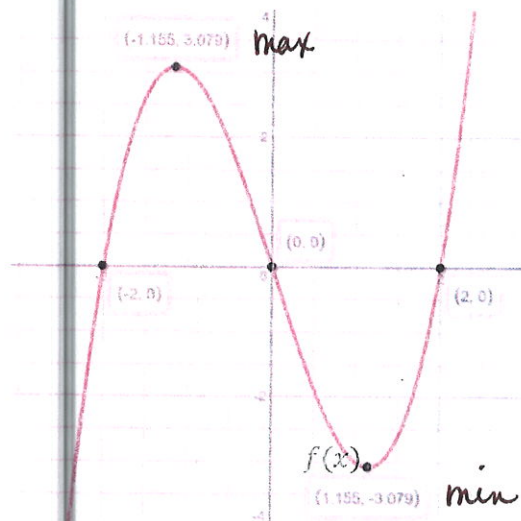
17. Suppose that the graph of a function f is known. Then the graph of $y = -f(x)$ may be obtained by:

a. Reflecting the graph over the x-axis

b. Reflecting the graph over the y-axis

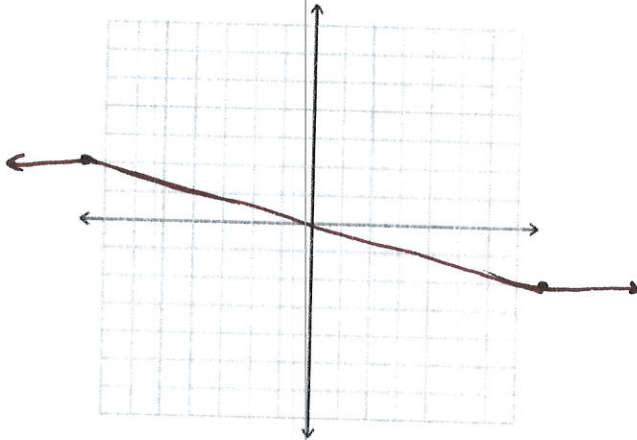
c. Shifting the graph to the left by 1

d. Shifting the graph down by 1

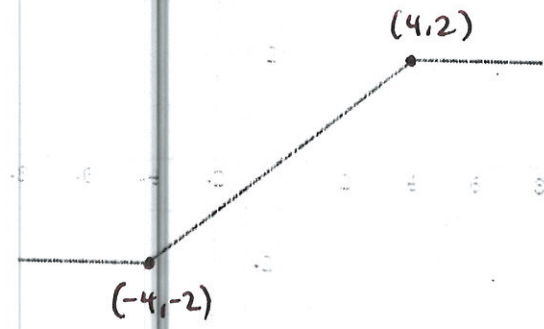
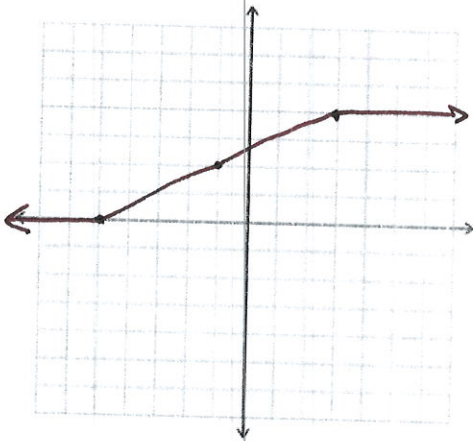


18. Consider the graph of $f(x)$ to the right.

a. Sketch $y = -f(\frac{1}{2}x)$



b. Sketch $f(x+1)+2$

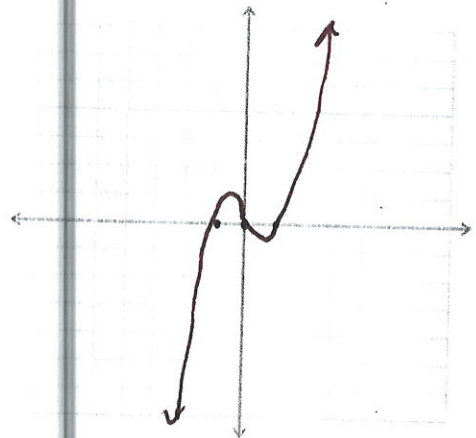


19. Consider $f(x) = x^3 - x$.

a. Is f even, odd or neither? *odd*

b. Sketch the graph.

c. Verify your conjecture algebraically.



MTH 161 Practice Exam #1 Key

Some short solutions on problem sheet. This is work for longer problems. (1)

4. alternate answers

$$f(x) = 4x - 10 \quad g(x) = e^{2x+11}$$

$$6. \frac{-(x+h)^2 + 3(x+h) - 11 - (-x^2 + 3x - 11)}{h} =$$

$$\frac{-(x^2 + 2xh + h^2) + 3(x+h) - 11 + x^2 - 3x + 11}{h} =$$

$$\frac{-x^2 - 2xh - h^2 + 3x + 3h - 11 + x^2 - 3x + 11}{h} = \frac{-2xh - h^2 + 3h}{h}$$

$$= \frac{h(-2x - h + 3)}{h} = -2x - h + 3$$

7. $(fg)(x) = (x^2 - 1)\sqrt{2-x}$

$$f(0) = (0^2 - 1)\sqrt{2-0} = (-1)\sqrt{2} = -\sqrt{2}$$

8a. $x^2 - xy + y^2 = 4$

x-axis $y \rightarrow -y$

y-axis $x \rightarrow -x$

$$x^2 - x(-y) + (-y)^2 = 4$$

$$(-x)^2 - (-x)y + y^2 = 4$$

$$x^2 + xy + y^2 = 4 \quad \text{not the same}$$

$$x^2 + xy + y^2 = 4 \quad \text{not the same}$$

origin $x \rightarrow -x$ and $y \rightarrow -y$

$$(-x)^2 - (-x)(-y) + (-y)^2 = 4$$

$$x^2 - xy + y^2 = 4 \quad \text{same}$$

b. $x = y^2 - 2$

$x \rightarrow -x$ $-x = y^2 - 2$ not the same

$y \rightarrow -y$ $x = (-y)^2 - 2 \rightarrow x = y^2 - 2$ same

$x \rightarrow -x, y \rightarrow -y$ $-x = (-y)^2 - 2 \rightarrow x = -y^2 + 2$ not same

x-axis symmetry

10. $(\text{Sou})(t) = \sqrt{3 - \frac{t^2}{(t-4)^2}}$ $t \neq 4$


$$\begin{aligned} & 3(t^2 - 8t + 16) - t^2 \\ & 3t^2 - 24t + 48 - t^2 \\ & 2t^2 - 24t + 48 \\ & 2(t^2 - 12t + 24) \end{aligned}$$

$$(\text{Sou})(t) = \sqrt{2(t^2 - 12t + 24)}$$

$$t = \frac{12 \pm \sqrt{144 - 96}}{2} = \frac{12 \pm \sqrt{48}}{2} = \frac{12 \pm 4\sqrt{3}}{2} = 6 \pm 2\sqrt{3}$$

$$2t^2 - 24t + 48 > 0 \quad (-\infty, 6 - 2\sqrt{3}] \cup [6 + 2\sqrt{3}, \infty)$$

12.

 fails vertical line test

13. $\sqrt[3]{x+1} \neq 0$ $x+1 \neq 0$ $x \neq -1$ $(-\infty, -1) \cup (-1, \infty)$

14. a. relative max at $(-1.155, 3.079)$
relative min at $(1.155, -3.079)$

15. a. $(x + 0.75x) + 0.06(x + 0.75x) = 1.06(1.75x) = 1.855x$

b. $1.855(97) = 179.94$

19. $y = x(x^2 - 1)$ zeros at $x = -1, 0, 1$

c. $f(-x) = (-x)^3 - (-x) = -x^3 + x = -(x^3 - x) = -f(x)$