07-19-19
07-21-19

Student: ____________	**Instructor:** Alfredo Alvarez	**Assignment:**
Date: ____________	**Course:** Math 1314 Alvarez	M1314FIESTACOREFINALU025g

07-23-19
07-25-19

1. Solve the equation by the method of your choice.

$$3x^2 - 4x = 15$$

The solution set is { }.
(Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

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2. Solve the given radical equation. Check all proposed solutions.

$$\sqrt{2x + 20} = x + 6$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

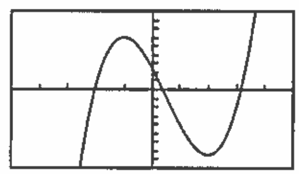
○ **A.** The solution set is { }.
(Use a comma to separate answers as needed.)

○ **B.** There is no solution.

---

3. The graph and equation of the function f are given.
a. Use the graph to find any values at which f has a relative maximum, and use the equation to calculate the relative maximum for each value.
b. Use the graph to find any values at which f has a relative minimum, and use the equation to calculate the relative minimum for each value.

$f(x) = 2x^3 - 3x^2 - 12x + 5$



$[-5,5,1]$ by $[-18,18,2]$

a. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

○ **A.** The function f has (a) relative maxima(maximum) at ________ and the relative maxima(maximum) are(is) ________.
(Use a comma to separate answers as needed.)

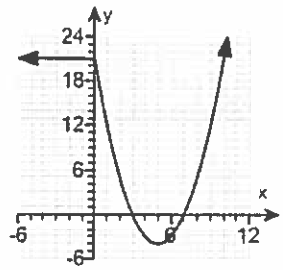
○ **B.** The function f has no relative maxima.

b. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

○ **A.** The function f has (a) relative minima(minimum) at ________ and the relative minima(minimum) are(is) ________.
(Use a comma to separate answers as needed.)

○ **B.** The function f has no relative minima.

4. Use the graph to find the following.



(a) the domain of f
(b) the range of f
(c) the x-intercepts
(d) the y-intercept
(e) intervals on which f is increasing
(f) intervals on which f is decreasing
(g) intervals on which f is constant
(h) the number at which f has a relative minimum
(i) the relative minimum of f
(j) f(− 3)
(k) The values of x for which f(x) = − 3
(l) Is f even, odd or neither?

(a) What is the domain of f?

☐ (Type your answer in interval notation.)

(b) What is the range of f?

☐ (Type your answer in interval notation.)

(c) What are the zeros of the function?

The left zero of the function is 3 and the right zero is ☐.

(d) What is the y-intercept?

The y-intercept of the function is ☐.

(e) Over what interval is f increasing?

☐ (Type your answer in interval notation.)

(f) Over what interval is f decreasing?

☐ (Type your answer in interval notation.)

(g) Over what interval is f constant?

☐ (Type your answer in interval notation.)

(h) What is the number at which f has a relative minimum?

☐

(i) What is the relative minimum of f?

☐

(j) What is f(− 3)?

f(− 3) = ☐

(k) What are the x-values where f(x) = − 3? The leftmost x-value where f(x) = − 3 is when x = 4.

What is the rightmost x-value where f(x) = − 3?

x = ☐

(l) Is f even, odd, or neither?

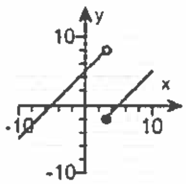
○ odd

5. The domain of the piecewise function is $(-\infty, \infty)$.
   a. Graph the function.
   b. Use your graph to determine the function's range.

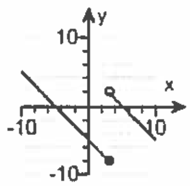
$$f(x) = \begin{cases} x + 5 & \text{if } x < 3 \\ x - 5 & \text{if } x \geq 3 \end{cases}$$

a. Choose the correct graph below.

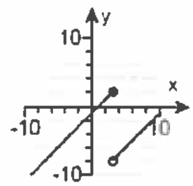
○ **A.**



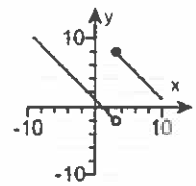
○ **B.**



○ **C.**



○ **D.**



b. The range of f(x) is [ ]. (Type your answer in interval notation.)

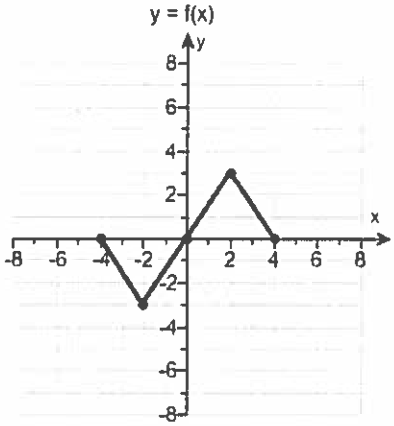
6. Find the difference quotient of f; that is, find $\frac{f(x+h)-f(x)}{h}$, $h \neq 0$, for the following function. Be sure to simplify.

$f(x) = x^2 - 2x + 8$

$\frac{f(x+h)-f(x)}{h} =$ [ ] (Simplify your answer.)

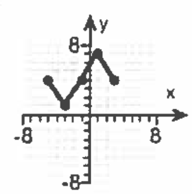
7. Use the graph of y = f(x) to graph the function $g(x) = f(x+1) + 4$.

y = f(x)

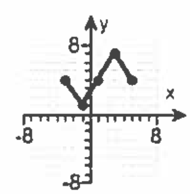


Choose the correct graph of g below.

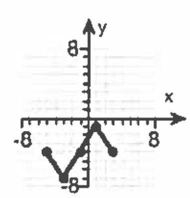
○ **A.**



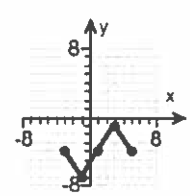
○ **B.**



○ **C.**



○ **D.**



8. Find the domain of the function.

$f(x) = \sqrt{18 - 2x}$

What is the domain of f?

[ ] (Type your answer in interval notation.)

9. First find f + g, f − g, fg and $\frac{f}{g}$. Then determine the domain for each function.

$f(x) = 3x + 4,\ g(x) = x + 7$

$(f+g)(x) =$ ______ (Simplify your answer.)

What is the domain of f + g?

- ○ $\left(-\frac{11}{4},\infty\right)$
- ○ $(-\infty,\infty)$
- ○ $[0,\infty)$
- ○ $\left(-\infty,-\frac{11}{4}\right)\cup\left(-\frac{11}{4},\infty\right)$

$(f-g)(x) =$ ______ (Simplify your answer.)

What is the domain of f − g?

- ○ $(-\infty,\infty)$
- ○ $\left(-\infty,\frac{3}{2}\right)\cup\left(\frac{3}{2},\infty\right)$
- ○ $\left(\frac{3}{2},\infty\right)$
- ○ $[0,\infty)$

$(fg)(x) =$ ______

What is the domain of fg?

- ○ $[0,\infty)$
- ○ $(-\infty,-7)\cup(-7,\infty)$
- ○ $(-\infty,\infty)$
- ○ $\left(-\infty,-\frac{4}{3}\right)\cup\left(-\frac{4}{3},\infty\right)$

$\left(\frac{f}{g}\right)(x) =$ ______

What is the domain of $\frac{f}{g}$?

- ○ $[0,\infty)$
- ○ $(-\infty,-7)\cup(-7,\infty)$
- ○ $(-7,\infty)$
- ○ $(-\infty,\infty)$

10. For $f(x) = x + 2$ and $g(x) = 2x + 2$, find the following functions.

a. $(f \circ g)(x)$; **b.** $(g \circ f)(x)$; **c.** $(f \circ g)(0)$; **d.** $(g \circ f)(0)$

a. $(f \circ g)(x) =$ (Simplify your answer.)

b. $(g \circ f)(x) =$ (Simplify your answer.)

c. $(f \circ g)(0) =$

d. $(g \circ f)(0) =$

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11. The function $f(x) = 5x + 5$ is one-to-one.

Find an equation for $f^{-1}(x)$, the inverse function.

$f^{-1}(x) =$

(Type an expression for the inverse. Use integers or fractions for any numbers in the expression.)

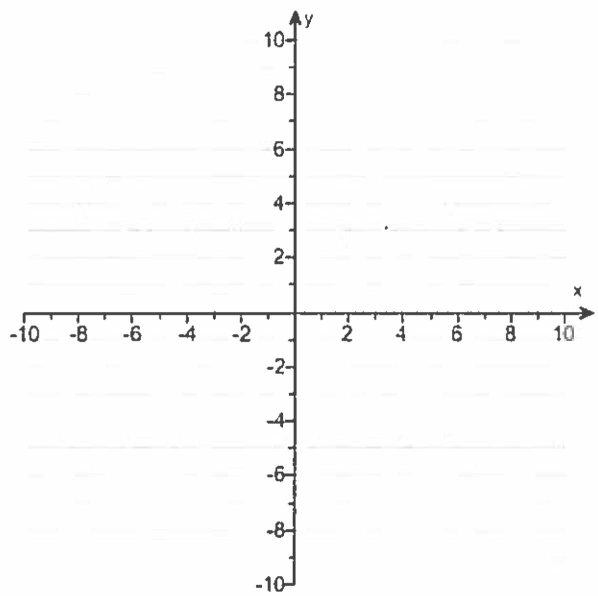
12.

Use the vertex and intercepts to sketch the graph of the quadratic function. Give the equation of the parabola's axis of symmetry. Use the graph to determine the domain and range of the function.

$f(x) = (x - 4)^2 - 9$

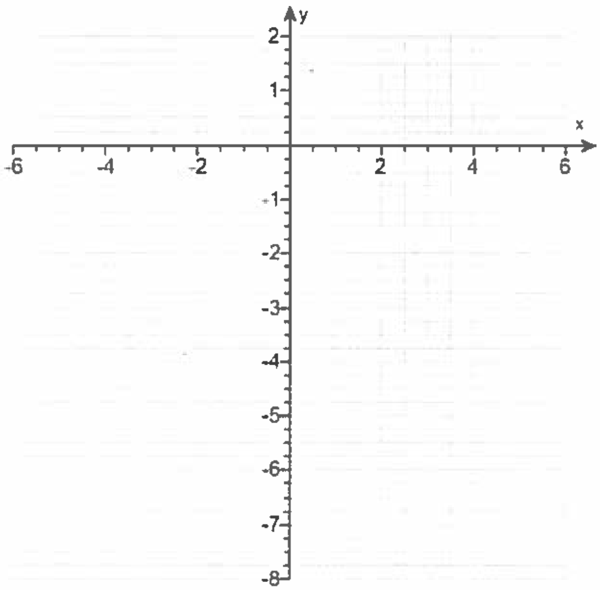
Use the graphing tool to graph the function. Use the vertex and one of the intercepts when drawing the graph.

The axis of symmetry is .
(Type an equation. Simplify your answer.)
The domain of the function is .
(Type your answer in interval notation.)
The range of the function is .
(Type your answer in interval notation.)



13. Use the vertex and intercepts to sketch the graph of the quadratic function. Give the equation for the parabola's axis of symmetry. Use the parabola to identify the function's domain and range.

$$f(x) = x^2 + x - 6$$



Use the graphing tool to graph the equation. Use the vertex and one of the intercepts to graph the equation.

The axis of symmetry is ______.
(Type an equation.)

Identify the function's domain.
The domain is ______.
(Type the answer in interval notation.)

Identify the function's range.
The range is ______.
(Type the answer in interval notation.)

---

14. Consider the function $f(x) = -2x^2 + 16x - 8$.

a. Determine, without graphing, whether the function has a minimum value or a maximum value.
b. Find the minimum or maximum value and determine where it occurs.
c. Identify the function's domain and its range.

a. The function has a (1) ______ value.

b. The minimum/maximum value is ______. It occurs at x = ______.

c. The domain of f is ______. (Type your answer in interval notation.)

The range of f is ______. (Type your answer in interval notation.)

(1) ○ maximum
○ minimum

---

15. Write the equation of the following parabola in standard form.

The vertex is $(-2, -3)$ and the graph passes through the point $(3,2)$.

Choose the correct equation below.

○ **A.** $f(x) = \frac{1}{5}(x+2)^2 - 3$

○ **B.** $f(x) = -\frac{2}{5}(x+2)^2 - 3$

○ **C.** $f(x) = \frac{1}{5}(x+2)^2 + 3$

○ **D.** $f(x) = (x-2)^2 - 3$

---

16. The following equation is given.

$$x^3 - 5x^2 - 4x + 20 = 0$$

a. List all rational roots that are possible according to the Rational Zero Theorem.

(Use a comma to separate answers as needed.)

b. Use synthetic division to test several possible rational roots in order to identify one actual root.

One rational root of the given equation is ______.
(Simplify your answer.)

c. Use the root from part (b.) and solve the equation.

The solution set of $x^3 - 5x^2 - 4x + 20 = 0$ is $\{\ \ \}$.
(Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

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17. Find the vertical asymptotes, if any, and the values of x corresponding to holes, if any, of the graph of the rational function.

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

Select the correct choice below and, if necessary, fill in the answer box to complete your choice. (Type an equation. Use a comma to separate answers as needed.)

- A. The vertical asymptote(s) is(are) ______. There are no holes.
- B. The vertical asymptote(s) is(are) ______ and hole(s) corresponding to ______.
- C. There are no vertical asymptotes but there is(are) hole(s) corresponding to ______.
- D. There are no discontinuities.

---

18. Find the horizontal asymptote, if any, of the graph of the rational function.

$$g(x) = \frac{24x^2}{6x^2 + 7}$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The horizontal asymptote is ______. (Type an equation.)
- B. There is no horizontal asymptote.

---

19. Use properties of logarithms to expand the logarithmic expression as much as possible. Evaluate logarithmic expressions without using a calculator if possible.

$$\log_b\left(\frac{x^3y}{z^7}\right)$$

$$\log_b\left(\frac{x^3y}{z^7}\right) = \square$$

---

20. Solve the following exponential equation by expressing each side as a power of the same base and then equating exponents.

$$4^{x+1} = 16^{x-1}$$

The solution set is { }.

21. Solve the following logarithmic equation. Be sure to reject any value of x that is not in the domain of the original logarithmic expression. Give the exact answer.

$$\log_3(x+3) = 2$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The solution set is { }. (Type an integer or a simplified fraction.)
- B. There is no solution.

22. Solve the logarithmic equation. Be sure to reject any value of x that is not in the domain of the original logarithmic expressions. Give the exact answer.

$$\log x + \log(x+4) = \log 12$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The solution set is { }.
  (Simplify your answer. Use a comma to separate answers as needed.)
- B. There is no solution.

23. Complete the table for a savings account subject to 2 compoundings yearly.

$$\left[A = P\left(1 + \frac{r}{n}\right)^{nt}\right]$$

Amounted Invested	Number of Compounding Periods	Annual Interest Rate	Accumulated Amount	Time t in Years
$10,000	2	6%	$17,000	?

Let A represent the accumulated amount, P the amount invested, n the number of compounding periods, r the annual interest rate, and t the time. Find the time, t.

t = ______ years
(Do not round until the final answer. Then round to one decimal place as needed.)

24. Complete the table for a savings account subject to continuous compounding.

$$\left(A = Pe^{rt}\right)$$

Amount Invested	Annual Interest Rate	Accumulated Amount	Time t in years
$6000	13%	$12,000	?

Let A represent the accumulated amount, P the amount invested, r the annual interest rate, and t the time. Find the time, t.

$t \approx$ ______ years
(Round to one decimal place as needed.)

25. Solve the given system of equations.

$$x + y + 6z = -15$$
$$x + y + 8z = -19$$
$$x + 7y + 2z = -13$$

Select the correct choice below and fill in any answer boxes within your choice.

- ○ **A.** There is one solution. The solution set is $\{(\_\_\_\_, \_\_\_\_, \_\_\_\_)\}$. (Simplify your answers.)
- ○ **B.** There are infinitely many solutions.
- ○ **C.** There is no solution.

1. $3, -\frac{5}{3}$

2. A. The solution set is $\{\boxed{-2}\}$.(Use a comma to separate answers as needed.)

3. A.
The function f has (a) relative maxima(maximum) at $\boxed{-1}$ and the relative maxima(maximum) are(is) $\boxed{12}$.
(Use a comma to separate answers as needed.)

A.
The function f has (a) relative minima(minimum) at $\boxed{2}$ and the relative minima(minimum) are(is) $\boxed{-15}$.
(Use a comma to separate answers as needed.)

4. $(-\infty,\infty)$

$[-4,\infty)$

7

21

$(5,\infty)$

$(0,5)$

$(-\infty,0)$

5

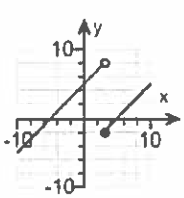
-4

21

6

neither

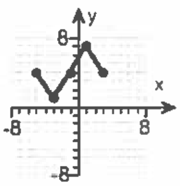
5.



A.

$(-\infty,\infty)$

6. $2x+h-2$

7. 

A.

8. $(-\infty,9]$

9. $4x+11$

$(-\infty,\infty)$

$2x-3$

$(-\infty,\infty)$

$3x^2+25x+28$

$(-\infty,\infty)$

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

$(-\infty,-7)\cup(-7,\infty)$

10. $2x+4$

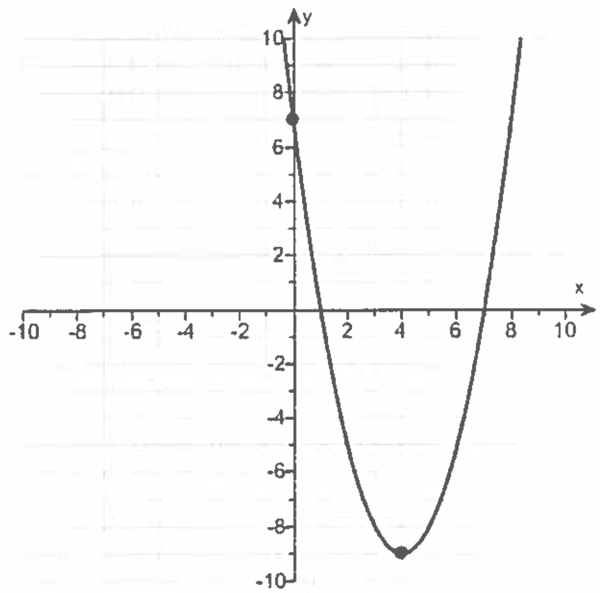
$2x+6$

4

6

11. $\frac{x-5}{5}$

12.

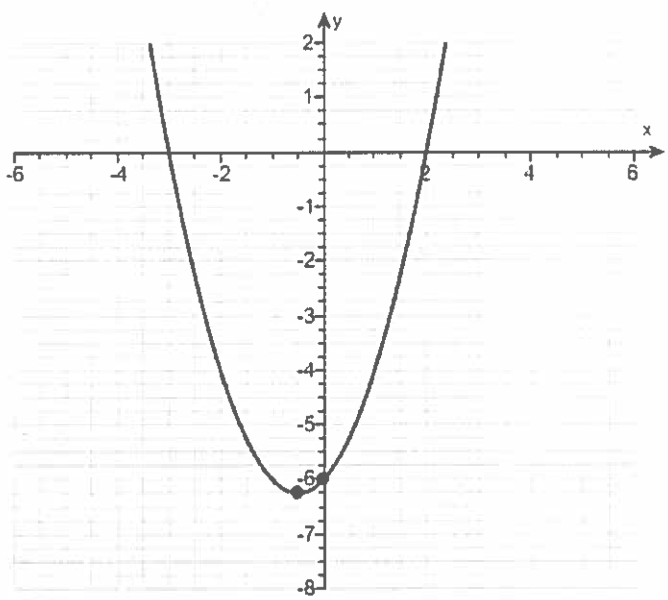


x = 4

(− ∞,∞)

[− 9,∞)

13.



x = − 0.5

(− ∞,∞)

[− 6.25,∞)

---

14. (1) maximum

24

4

$(-\infty,\infty)$

$(-\infty,24]$

---

15. A. $f(x) = \frac{1}{5}(x+2)^2 - 3$

---

16. $1,-1,2,-2,20,-20,5,-5,10,-10,4,-4$

5

$5,2,-2$

---

17. A. The vertical asymptote(s) is(are) $x=3, x=0$. There are no holes.

---

18. A. The horizontal asymptote is $y=4$. (Type an equation.)

---

19. $3\log_b x + \log_b y - 7\log_b z$

---

20. 3

---

21. A. The solution set is $\{6\}$. (Type an integer or a simplified fraction.)

---

22. A. The solution set is $\{2\}$.(Simplify your answer. Use a comma to separate answers as needed.)

---

23. 9.0

---

24. 5.3

---

25. A.

There is one solution. The solution set is $\{(-2, -1, -2)\}$. (Simplify your answers.)

Part 1

M134 Fiesta Core final 4025 g

Possible

3.1

15.1

3.5

1) $3x^2 - 4x = 15$

$3x^2 - 4x - 15 = 0$ rewrite

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

set $3x+5=0$ OR $x-3=0$

$3x+5-5=0-5$ OR $x-3+3=0+3$

$3x=-5$ OR $x=3$

$\frac{3x}{3} = \frac{-5}{3}$

$x = -5/3$

Solve by factoring

Part 2

1) $3x^2 - 4x = 15$

Solve by the Quadratic formula

$3x^2 - 4x - 15 = 0$ rewrite

$a = 3, \quad b = -4, \quad c = -15$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-15)}}{2(3)}$$

$$x = \frac{4 \pm \sqrt{16 + 180}}{6}$$

$$x = \frac{4 \pm \sqrt{196}}{6}$$

$$x = \frac{4 \pm 14}{6}$$

$x = \frac{4+14}{6}$ or $x = \frac{4-14}{6}$

$x = \frac{18}{6}$ or $x = \frac{-10}{6}$

$x = 3$ or $x = \frac{\cancel{2}(-5)}{\cancel{2}(3)}$

$x = -5/3$

② $\sqrt{2x+20} = x+6$ Solve

$(\sqrt{2x+20})^2 = (x+6)^2$

$2x+20 = (x+6)(x+6)$

$2x+20 = x^2+6x+6x+36$

$2x+20 = x^2+12x+36$

$0 = x^2+12x+36-2x-20$

$0 = x^2+10x+16$

$0 = (x+2)(x+8)$

Possibly

16.1

2.8

4.4

set $x+2=0$ OR $x+8=0$

$x+2-2=0-2$ OR $x+8-8=0-8$

$x=-2$ OR $x=-8$

Check

$\sqrt{2x+20} = x+6$

$\sqrt{2(-2)+20} = (-2)+6$

$\sqrt{-4+20} = -2+6$

$\sqrt{16} = 4$

$4 = 4$

Good

$\sqrt{2(-8)+20} = (-8)+6$

$\sqrt{-16+20} = -8+6$

$\sqrt{4} = -2$

$2 \neq -2$

BAD

answer

$\boxed{x=-2}$

③ find relative max or min

$f(x) = 2x^3 - 3x^2 - 12x + 5$

window

X-min = −5

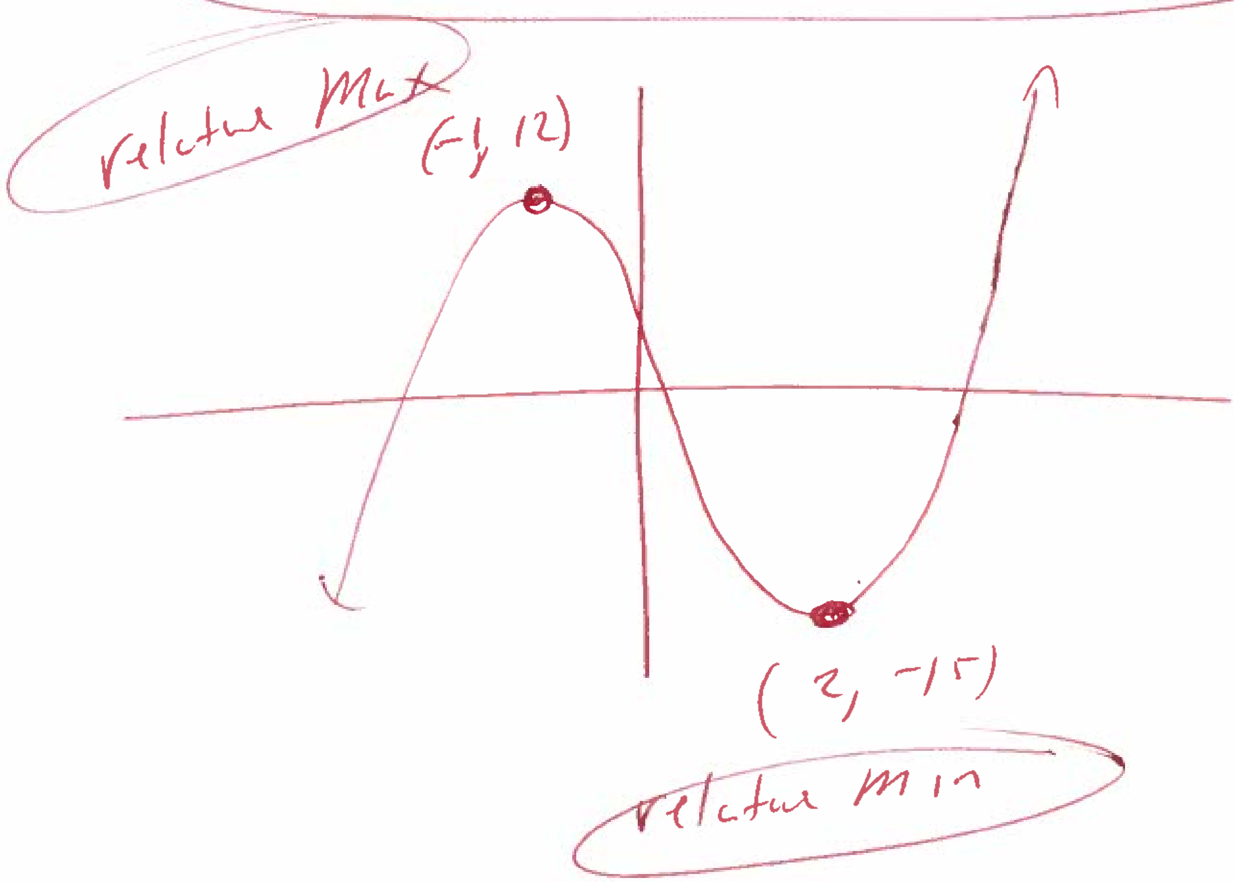
X-max = 5

y-min = −18

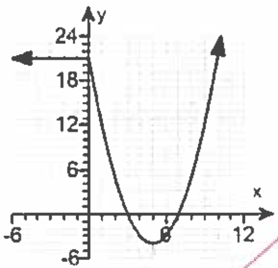
y-max = 18

use graphing calculator

$y_1 = 2x\wedge3 - 3x\wedge2 - 12x + 5$



4. Use the graph to find the following:



(a) the domain of f
(b) the range of f
(c) the x-intercepts
(d) the y-intercept
(e) intervals on which f is increasing
(f) intervals on which f is decreasing
(g) intervals on which f is constant
(h) the number at which f has a relative minimum
(i) the relative minimum of f
(j) f(− 3)
(k) The values of x for which f(x) = − 3
(l) Is f even, odd or neither?

(a) What is the domain of f?

$(-\infty, \infty)$ (Type your answer in interval notation.)

(b) What is the range of f?

$[-4, \infty)$ (Type your answer in interval notation.)

(c) What are the zeros of the function?

The left zero of the function is 3 and the right zero is 7.

(d) What is the y-intercept?

The y-intercept of the function is (0, 21).

(e) Over what interval is f increasing?

$(5, \infty)$ (Type your answer in interval notation.)

(f) Over what interval is f decreasing?

$(0, 5)$ (Type your answer in interval notation.)

(g) Over what interval is f constant?

$(-\infty, 0)$ (Type your answer in interval notation.)

(h) What is the number at which f has a relative minimum?

(5, −4)

(i) What is the relative minimum of f?

−4

(j) What is f(− 3)?

f(− 3) = 21

(k) What are the x-values where f(x) = − 3? The leftmost x-value where f(x) = − 3 is when x = 4.

What is the rightmost x-value where f(x) = − 3?

x = 6

(l) Is f even, odd, or neither?

○ odd

5. graph

$$f(x) = \begin{cases} x+5 & \text{if } x<3 \\ x-5 & \text{if } x \geq 3 \end{cases}$$

window

x-min = −12

x-max = 12

y-min = −10

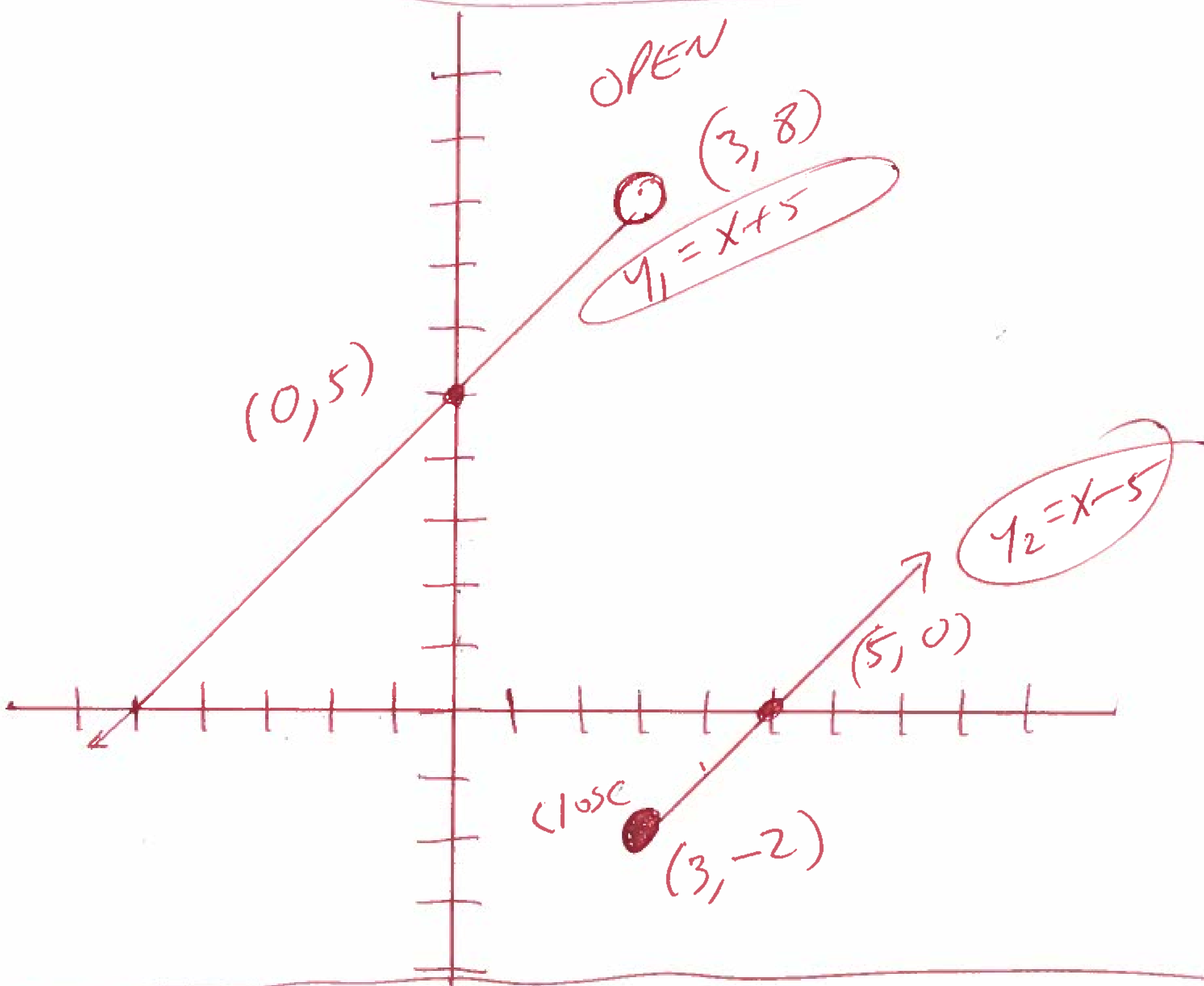
y-max = 10

use graphing calculator

2ND math

$y_1 = x+5 \div (x<3)$ open circle

$y_2 = x-5 \div (x \geq 3)$ close circle



(6) $f(x) = x^2 - 2x + 8$

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

$$\frac{((x+h)^2 - 2(x+h) + 8) - (x^2 - 2x + 8)}{h} =$$

$$\frac{(x+h)(x+h) - 2x - 2h + 8 - x^2 + 2x - 8}{h} =$$

$$\frac{x^2 + xh + xh + h^2 - 2x - 2h + 8 - x^2 + 2x - 8}{h} =$$

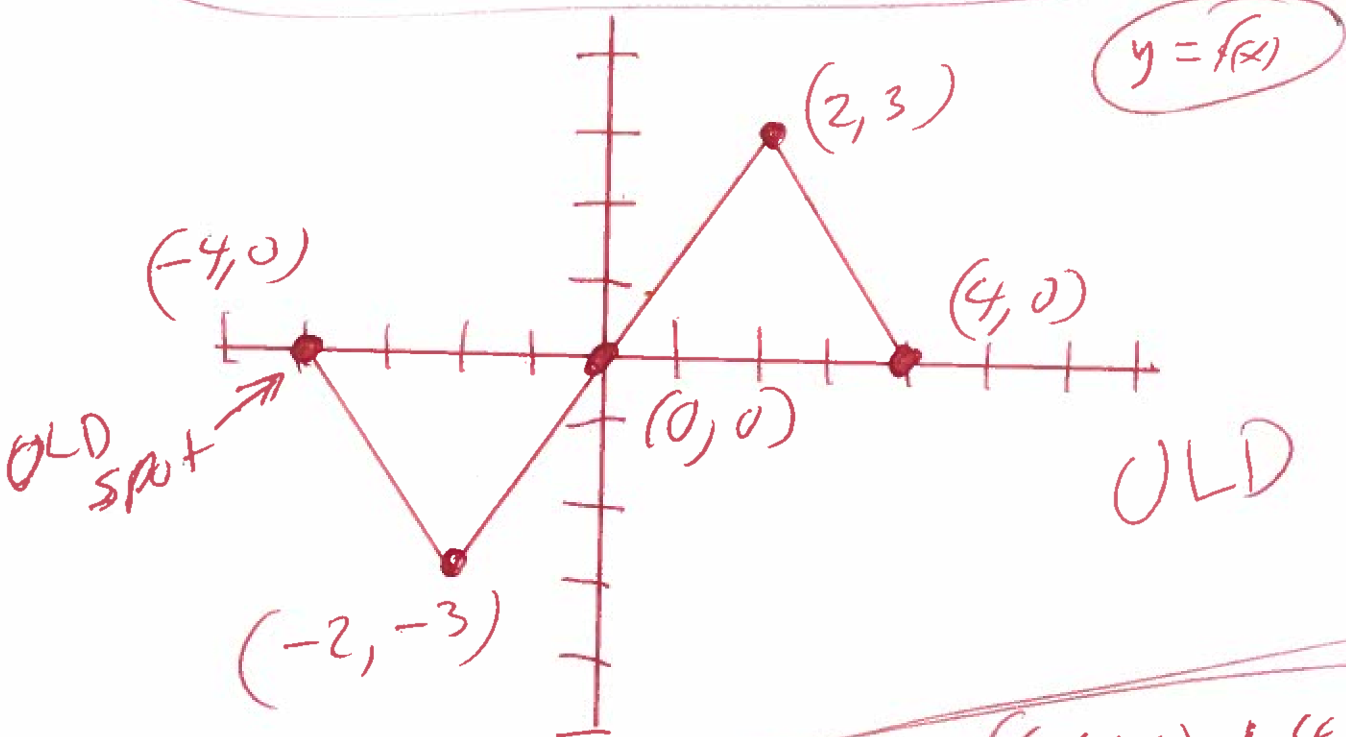
$$\frac{\cancel{x^2} + 2xh + h^2 - \cancel{2x} - 2h \cancel{+8} \cancel{-x^2} + \cancel{2x} \cancel{-8}}{h} =$$

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

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

$$2x + h - 2 =$$

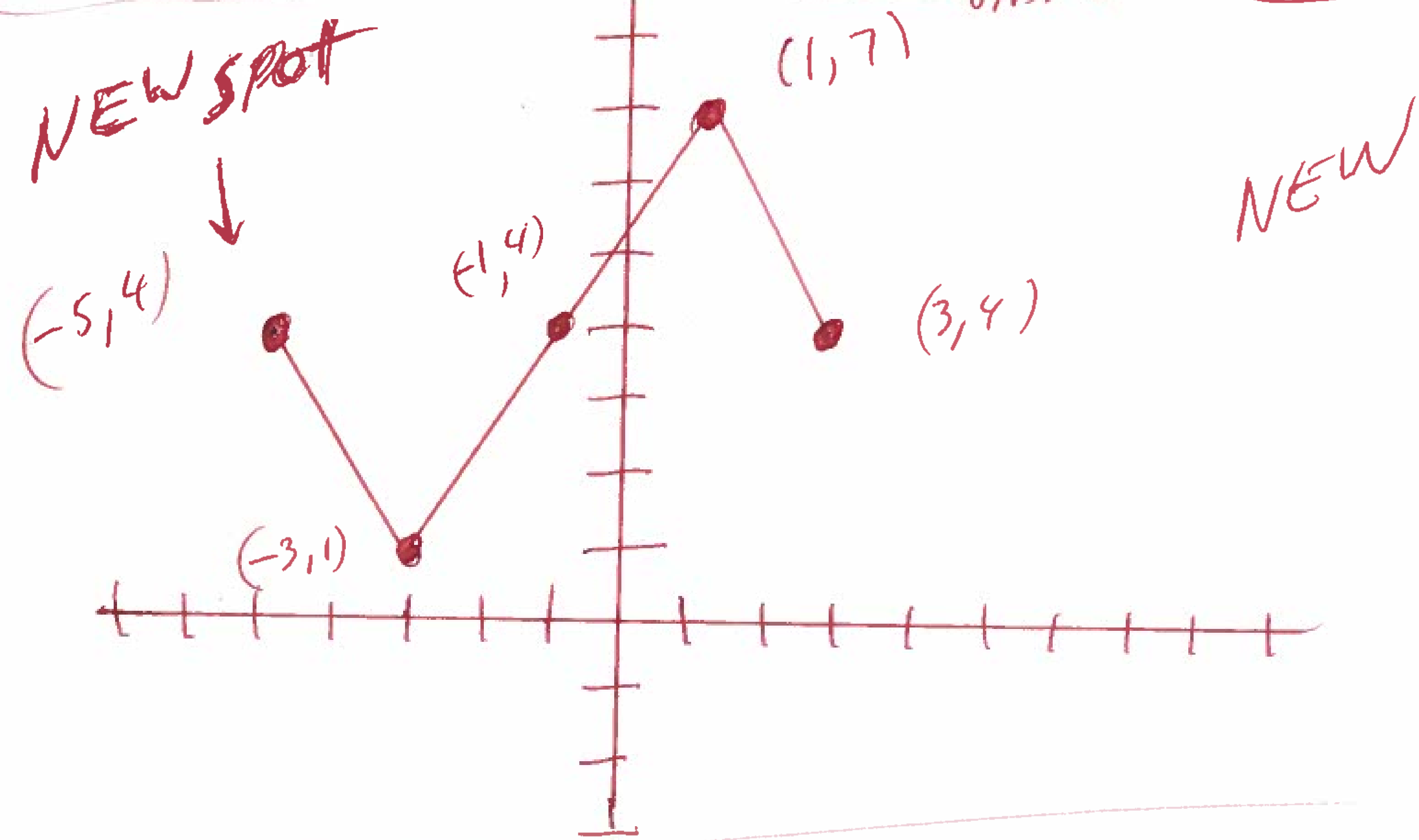
7. use the graph of $y = f(x)$ to graph the function $g(x) = f(x+1) + 4$



$g(x) = f(x+1) + 4$

Shift left −1 opposite

Shift up 4



(8.) find domain

$f(x) = \sqrt{18-2x}$

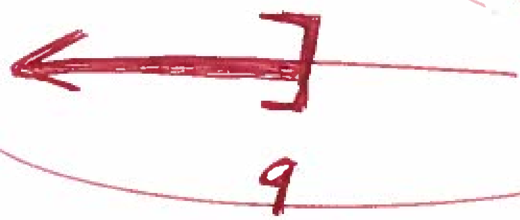
set $18 - 2x \geq 0$

$\cancel{18} - 2x - \cancel{18} \geq 0 - 18$

$-2x \geq -18$

$\frac{-2x}{-2} \leq \frac{-18}{-2}$ divide by a negative and turn alligator around

$x \leq 9$



$(-\infty, 9]$

formula domain

$f(x) = \sqrt{Ax+B}$

set $Ax + B \geq 0$

⑨ $f(x) = 3x+4$ and $g(x) = x+7$

$(f+g)(x) =$

$f(x) + g(x) =$

$(3x+4)+(x+7) =$

$3x+4+x+7 =$

$4x+11 =$ domain $(-\infty, \infty)$

$(f-g)(x) =$

$f(x) - g(x) =$

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

$3x+4-x-7 =$

$2x-3 =$ doman $(-\infty, \infty)$

$(f \cdot g)(x) =$

$f(x) \cdot g(x) =$

$(3x+4)(x+7) =$

$3x^2+21x+4x+28 =$

$3x^2+25x+28 =$ doman $(-\infty, \infty)$

$\left(\frac{f}{g}\right)(x) =$

$\frac{f(x)}{g(x)} =$

domain

$\frac{3x+4}{x+7} =$ $(-\infty, -7) \cup (-7, \infty)$

(10) $f(x) = x+2$ and $g(x) = 2x+2$

$(f \circ g)(x) =$
$f(g(x)) =$
$f(2x+2) =$
$(2x+2)+2 =$
$2x+2+2 =$
$2x+4 =$ ✓

$(g \circ f)(x) =$
$g(f(x)) =$
$g(x+2) =$
$2(x+2)+2 =$
$2x+4+2 =$ ✓
$2x+6 =$

$(f \circ g)(x) = 2x+4$
$(f \circ g)(0) = 2(0)+4$
$(f \circ g)(0) = 0+4$ ✓
$(f \circ g)(0) = 4$

$(g \circ f)(x) = 2x+6$
$(g \circ f)(0) = 2(0)+6$
$(g \circ f)(0) = 0+6$ ✓
$(g \circ f)(0) = 6$

(11.) the function $f(x) = 5x+5$ is one-to-one.

find an equation for $f^{-1}(x)$ the inverse function

$f(x) = 5x+5$

$y = 5x+5$ set y = function

$x = 5y+5$ inverse variable $x \to y$

$x-5 = 5y+\cancel{5}-\cancel{5}$ Solve for y

$x-5 = 5y$

$\frac{x-5}{5} = \frac{\cancel{5}y}{\cancel{5}}$

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

rewrite inverse function

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

(12) graph

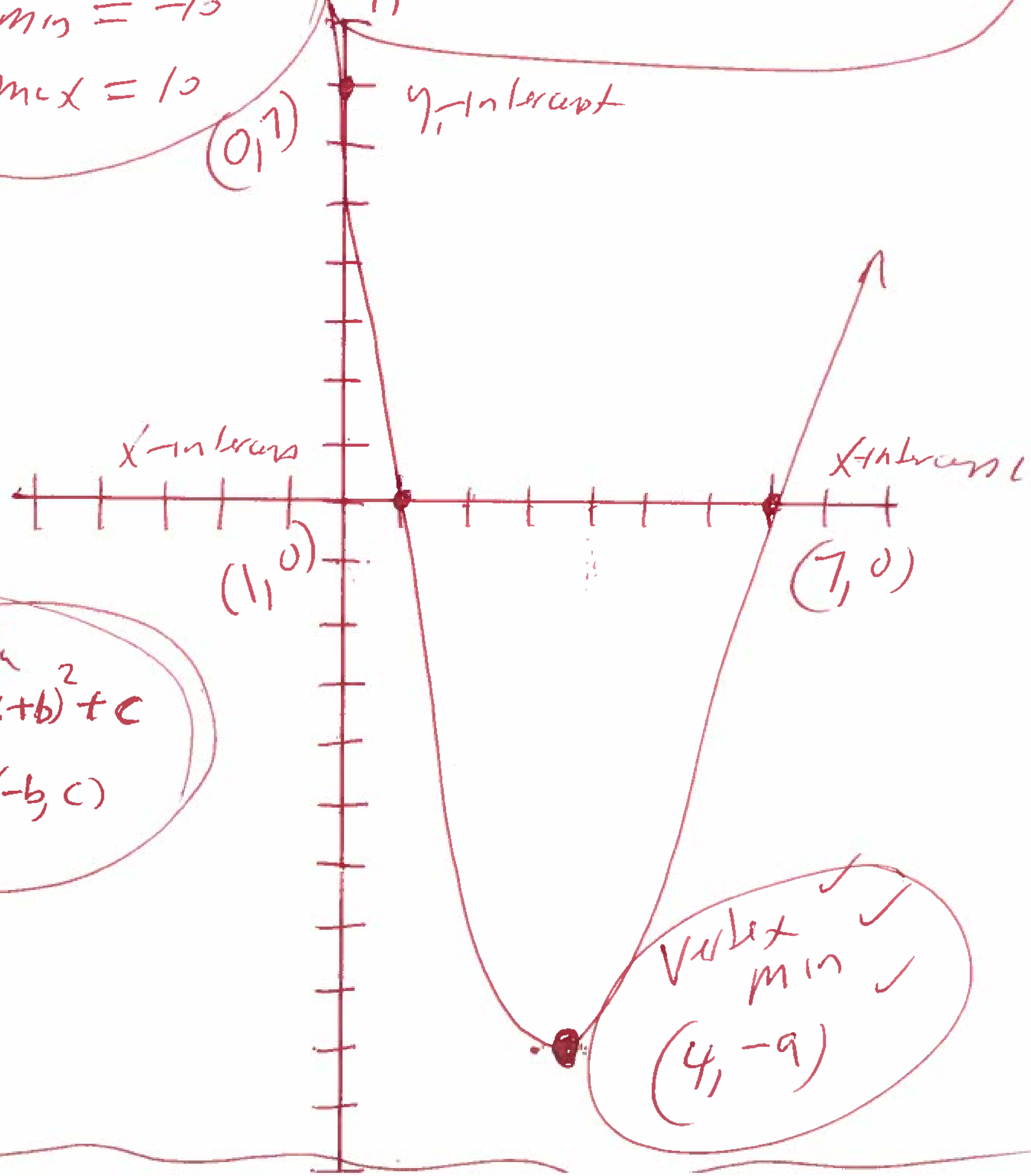
$f(x) = (x-4)^2 - 9$

Windows
$x\text{-min} = -12$
$x\text{-max} = 12$
$y\text{-min} = -10$
$y\text{-max} = 10$

use graphing calculator

$y_1 = ((x \underline{\quad B\pm G \quad} 4))^2 \underline{\quad B\pm G \quad} 9$

formula
$f(x) = a(x+b)^2 + c$
vertex $= (-b, c)$



(13) graph

$f(x) = x^2 + x - 6$

window

x-min = -12

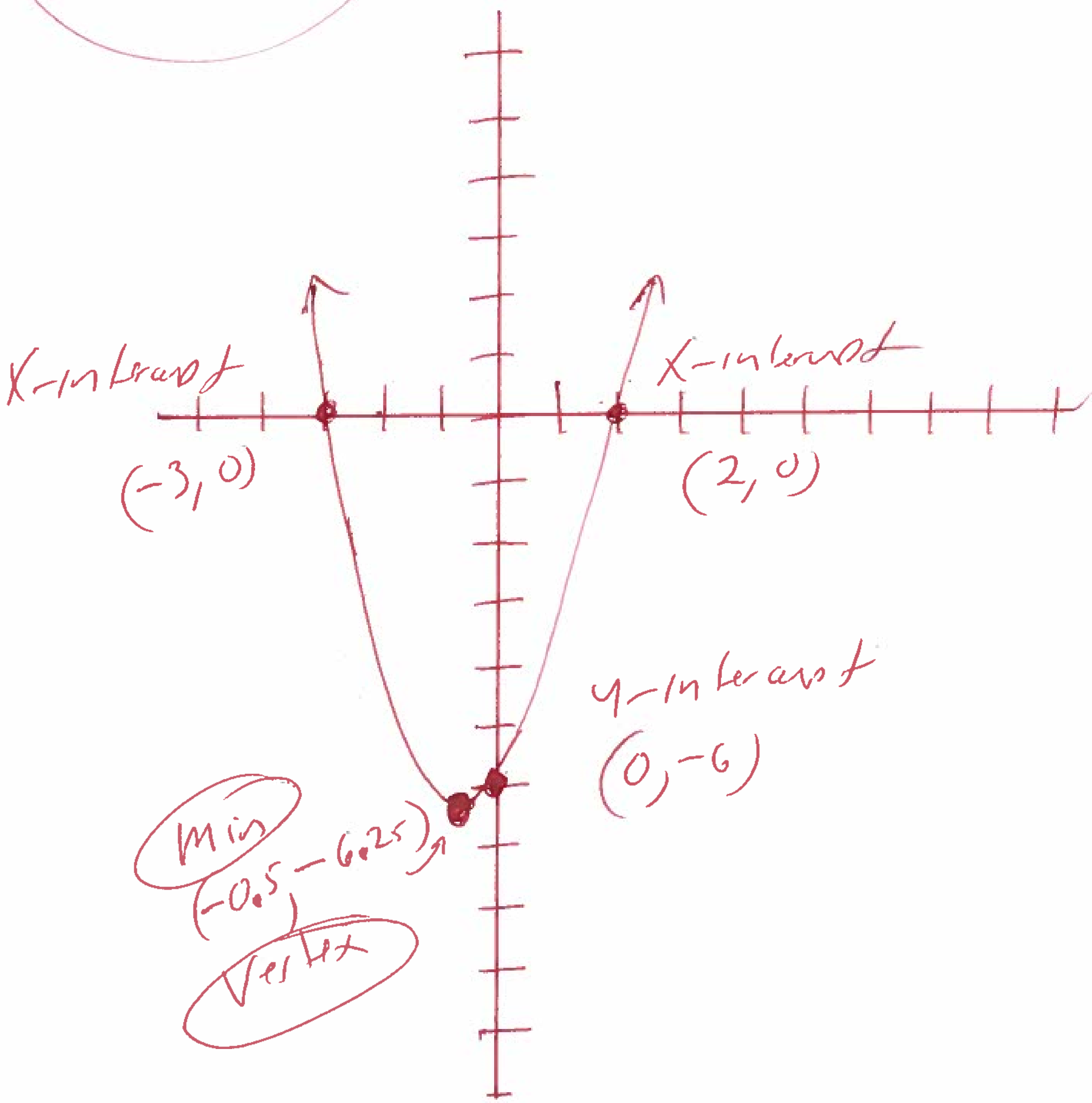
x-max = 12

y-min = -10

y-max = 10

use graphing calculator

$y_1 = x^2 + x \underset{\text{BIG}}{-} 6$



(14.) $f(x) = -2x^2 + 16x - 8$

$a = -2, \ b = 16, \ c = -8$

Graph opens down

MAX

$Max = Vertex = \left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

$Vertex = \left(\frac{-(16)}{2(-2)}, f\left(\frac{-(16)}{2(-2)}\right)\right)$

$Vertex = \left(\frac{-16}{-4}, f\left(\frac{-16}{-4}\right)\right)$

$Vertex = (4, f(4))$

$Vertex = (4, -2(4)^2 + 16(4) - 8)$

$Vertex = (4, -2(4)(4) + 16(4) - 8)$

$Vertex = (4, -32 + 64 - 8)$

$Vertex = (4, 24)$

MAX

(15.) write the equation of the following parabola in standard form.

the vertex is $(-2,-3)$ and the graph passes through the point $(3,2)$

formula
$$y=a(x+b)^2+c$$

vertex $=(-2,-3)$
x y
$-b$ c
opposite

$$y=a(x+2)^2-3$$

use $(3,2)$
x y

Solve for a

$$2=a(3+2)^2-3$$
$$2=a(5)^2-3$$
$$2=a(5)(5)-3$$
$$2=a(25)-3$$
$$2=25a-3$$
$$2+3=25a\cancel{-3}\cancel{+3}$$
$$5=25a$$
$$\frac{5}{25}=\frac{\cancel{25}a}{\cancel{25}}$$
$$\frac{5}{25}=a$$
$$\frac{\cancel{5}(1)}{\cancel{5}(5)}=a$$

$$\frac{1}{5}=a$$

answer

$$\boxed{y=\frac{1}{5}(x+2)^2-3}$$

(16) $1x^3 - 5x^2 - 4x + 20 = 0$

Possibly ration roots $\dfrac{\text{last}}{\text{first}}$

$\dfrac{\pm 20}{\pm 1}$

$\dfrac{\pm 20, \pm 10, \pm 5, \pm 4, \pm 2, \pm 1}{\pm 1}$

$\pm 20, \pm 10, \pm 5, \pm 4, \pm 2, \pm 1$

Use synthetic division
try $x = 2$

$$\begin{array}{r|rrrr} 2 & 1 & -5 & -4 & 20 \\ & & 2 & -6 & -20 \\ \hline & 1 & -3 & -10 & 0 \end{array}$$

0 rem

$x^2 - 3x - 10 = 0$

$(x+2)(x-5) = 0$

set $x + 2 = 0$ OR $x - 5 = 0$

$x + \cancel{2} - \cancel{2} = 0 - 2$ OR $x - \cancel{5} + \cancel{5} = 0 + 5$

$x = -2$ OR $x = 5$

answr

$\boxed{2, -2, 5}$

(17) Find the vertical asymptotes

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

Bottom only

set $x(x-3)=0$

$x=0$ OR $x-3=0$

$x-3+3=0+3$

$x=3$

Vertical asymptotes

$x=0$ OR $x=3$

(18.) find the horizontal asymptote

$$g(x) = \frac{24x^2}{6x^2+7} =$$

$$\lim_{x\to\infty} \frac{24x^2}{6x^2+7} =$$

$$\lim_{x\to\infty} \left(\frac{24x^2}{6x^2+7}\right) \frac{\frac{1}{x^2}}{\frac{1}{x^2}} =$$

formula

$$\lim_{x\to\infty} \frac{1}{x^n} = 0$$

$$\lim_{x\to\infty} \frac{\frac{24\cancel{x^2}}{\cancel{x^2}}}{\frac{6\cancel{x^2}}{\cancel{x^2}} + \frac{7}{x^2}} =$$

$$\lim_{x\to\infty} \frac{24}{6+\frac{7}{x^2}} =$$

$$\frac{24}{6+0} =$$

$$\frac{24}{6} =$$

$$4 =$$

horizontal asymptote

$$y = 4$$

(19) expand

$$\log_b\left(\frac{x^3y}{z^7}\right) =$$

$$\log_b(x^3y) - \log_b(z^7) =$$

$$\log_b(x^3) + \log_b(y) - \log_b(z^7) =$$

$$3\log_b(x) + \log_b(y) - 7\log_b(z) =$$

formulas

$$\log_b\left(\frac{A}{B}\right) = \log_b(A) - \log_b(B)$$

$$\log_b(AB) = \log_b(A) + \log_b(B)$$

$$\log_b(A^N) = N\log_b(A)$$

20. $4^{x+1} = 16^{x-1}$ Solve

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

$\cancel{2}^{2x+2} = \cancel{2}^{4x-4}$ mult powers

$2x+2 = 4x-4$ rewrite

$2x + \cancel{2} \cancel{-2} = 4x - 4 - 2$ Solve for x

$2x = 4x - 6$

$2x - 4x = \cancel{4x} - 6 \cancel{-4x}$

$-2x = -6$

$\frac{-2x}{-2} = \frac{-6}{-2}$

$x = 3$

(21) $\log_3(x+3) = 2$ Solve

$\log_3(x+3) = 2$

$3^2 = x+3$ rewrite

$3 \cdot 3 = x+3$

$9 = x+3$

$9-3 = x+\cancel{3}\cancel{-3}$

$6 = x$

Check

$\log_3(x+3) = 2$

$\log_3(6+3) = 2$

$\log_3(9) = 2$

Good

answer

$\boxed{x=6}$

22.

Solve

formula
$\log(A) + \log(B)$
$\log(AB)$

$\log(x) + \log(x+4) = \log(12)$

$\log(x)(x+4) = \log(12)$

$x(x+4) = 12$

$x^2 + 4x = 12$

$x^2 + 4x - 12 = 0$

$(x-2)(x+6) = 0$

Possibly
$12 \cdot 1$
$6 \cdot 2$
$3 \cdot 4$

Let $x - 2 = 0$ OR $x + 6 = 0$

$x - 2 + 2 = 0 + 2$ OR $x + 6 - 6 = 0 - 6$

$x = 2$ OR $\cancel{x = -6}$

Check

$\log(x) + \log(x+4) = \log(12)$

$\log(2) + \log(2+4) = \log(12)$

$\log(2) + \log(6) = \log(12)$

Good Good Good

$\log(-6) + \log(-6+4) = \log(12)$

$\log(-6) + \log(-2) = \log(12)$

BAD BAD

answer only

$\boxed{x = 2}$

23 $A = P\left(1 + \frac{r}{N}\right)^{Nt}$ Solve

$P = 10000$
$A = 17000$
$r = 6\% = .06$
$t = ?$
$N = 2$

$17000 = 10000\left(1 + \frac{.06}{2}\right)^{2t}$

$17000 = 10000(1 + .03)^{2t}$

$17000 = 10000(1.03)^{2t}$

$\frac{17000}{10000} = \frac{\cancel{10000}(1.03)^{2t}}{\cancel{10000}}$

formula
$\ln(A^N) =$
$N\ln(A) =$

$1.7 = (1.03)^{2t}$

$\ln(1.7) = \ln(1.03)^{2t}$

Use graphing Calculator

$\ln(1.7) = 2t\ln(1.03)$

$\frac{\ln(1.7)}{(2\ln(1.03))} = \frac{\cancel{2t\ln(1.03)}}{\cancel{(2\ln(1.03))}}$

$8.975807726 = t$

OR

$9.0 = t$

Round

24 $A = Pe^{rt}$ solve

$A = 12000$

$P = 6000$

$r = 13\% = .13$

$t = ?$

$12000 = 6000e^{.13t}$

$$\frac{12000}{6000} = \frac{6000e^{.13t}}{6000}$$

$2 = e^{.13t}$

$\ln(2) = \ln(e^{.13t})$

formula

$\ln(A^N) = N\ln(A)$

$\ln(e) = 1$

$\ln(2) = .13t\ln(e)$

$\ln(2) = .13t(1)$

$\ln(2) = .13t$

$$\frac{\ln(2)}{.13} = \frac{\cancel{.13}t}{\cancel{.13}}$$

$5.331901389 = t$

OR

$5.3 = t$ Round

(25)

Solve system

$$x+y+6z=-15$$
$$x+y+8z=-19$$
$$x+7y+2z=-13$$

Use a graphing calculator

Use matrix functions

2ND, Matrix, Edit, [A], 3x4, enter,

$$[A]=\begin{bmatrix} 1 & 1 & 6 & -15 \\ 1 & 1 & 8 & -19 \\ 1 & 7 & 2 & -13 \end{bmatrix}$$

2ND, Matrix, Math, ↓, rref(), 2ND Matrix

$$rref([A])=$$

$$\begin{array}{c} \begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & -2 \end{bmatrix} \end{array} \begin{array}{c} x \\ y \\ z \end{array}$$

$$(x, y, z)=(-2, -1, -2)$$