Week 1 Homework

Date: (1) Both Lydia & Marty have 2 phone numbers. Each x-value is not matched with only 1 y value. This relation is not a function.

(2) Determine if each of the following equations are functions!

a) a) $y = x^2 + 1$ We can let $x = 3$

b) $y^2 = x + 1$

a) $y = 3^2 + 1$

$y = 9 + 1 = 10$

$y = 10 \Rightarrow$ this is function

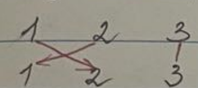
b) $y^2 = 3 + 1$

$y^2 = 4$

$y = \sqrt{4} = 2$ ~~or~~ -2 so this is not a function since it has 2 solutions.

(3) Which functions are surjective (i.e, onto)?

1. $f: \mathbb{Z} \to \mathbb{Z}$ defined by $f(n) = 3n$
2. $g: \{1, 2, 3\} \to \{a, b, c\}$ defined by $g = \begin{pmatrix} 1 & 2 & 3 \\ c & a & a \end{pmatrix}$
3. $h: \{1, 2, 3\} \to \{1, 2, 3)$ defined as follows



(1) Here the function multypies any whole number n by 3.

Possible values $-6, -3, 0, 3, 6, 9$

But it can't be number 1, (there is no n, so that $3n = 1$)

So not all whole numbers, so its not surjective.

(2) $g(1) = a$ $g(2) = a$ $g(3) = a$

all 3 inputs (1, 2 & 3) only map to "a"

· But the target set $\{a, b, c\}$ also has "b" & "c" & they are never reached.

Since not all elements in the target set are covered, this function is not surj.

(3) $h: \{1, 2, 3\} \to \{1, 2, 3\}$ given by the diagram:

$1 \to 1$, $2 \to 1$, $3 \to 3$

The target set is $\{1, 2, 3\}$ so we check

1 is covered (from 1 & 2)

2 is covered (from 2 & 1)

3 is covered (from 3)

So 3rd function is surjective.

(4) Which functions are injective? (one-to-one)

1) Suppose $f(a) = f(b)$ meaning $3a = 3b$ divide both sides by 3 $a = b$

- Since different inputs always give different outputs, $f(n)$ is injective.

2) $g(1) = a$ $g(2) = a$, $g(3) = a$ diff. inputs give same output. So not injective

3) $h(1) = 2$ $h(2) = 1$ $h(3) = 3$ Each input has a unique output ($1 \to 2$, $2 \to 1$, $3 \to 3$)

So its Injective, because they don't share the same output.

⑤ if $f(x) = \frac{1}{x+2}$ & $g(x) = \frac{1}{x} - 2$ is $g = f^{-1}$?

?

Date:

$g(f(x)) = \frac{1}{\left(\frac{1}{x+2}\right)} - 2 \underset{?}{=} x+2-2 = x.$

$g = f^{-1}$ & $f = g^{-1}$

$f(g(x)) = \frac{1}{\frac{1}{x} - 2 + 2} \overset{?}{=} \frac{1}{\frac{1}{x}} = x$

The ansher is yes.

⑥ Find the inverse of the function $f(x) = 2 + \sqrt{x-4}$

$- y = 2 + \sqrt{x+4}$

swap? $\to (y-2)^2 = x-4$

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

range of f $[2, \infty)$

domain f^{-1} $[2, \infty)$.

⑦ Find a formula for the inverse function that gives farenheit temperature as a function of Celsius temperature

$C = \frac{5}{9}(F-32)$ (formula for converting F to C)

So we need to find the inverse f, which expresses F temp. F as a function of Celsius tem C, we need to solve for F in terms of C.

1) Replace C with y & F with x.

$y = \frac{5}{9}(x-32)$

Our goal is to express x in terms of y, i.e. find $x = f^{-1}(y)$

2. Swap x & y.

$x = \frac{5}{9}(y-32)$

3.- Solve for y

- $\frac{5}{9}x = y - 32$
- $y = \frac{5}{9}x + 32$

Thus the inverse function is $F = \frac{9}{5}C + 32$

(8.) The domain & range of the following function:

Date: $g(x) = 2\sqrt{x-4}$

so here it contain a square root, & the expression inside the square root must be non-negative.

I So Condition for the domain: $x-4 \geq 0$

$x \geq 4$

Domain is $[4, \infty)$

II The smallest possible value of x is 4

when $x=4$

$g(4) = 2\sqrt{4-4} = 2\sqrt{0} = 0$

So function starts at $y=0$

As $x \to \infty$ $x-4$ gets very large & so does $\sqrt{x-4}$. Since it's multiplied by
$g(x)$ also increases to infinity. So the range is, $[0, \infty)$

(9) Find the domain & range of the following function:

$h(x) = -2x^2 + 4x - 9$.

This is a quadratic function of the form: $h(x) = ax^2 + bx + c$

where $a = -2$, $b=4$, $c=-9$.

Since its parabola & the coefficient of x^2 is $-$ $(a=-2)$ the parabola opens downward.

1) Find the Domain. For any quadratic function, the domain is always all real numbers, because you can plug in any x & get a valid output

Domain: $(-\infty, \infty)$

2) Find the Range. Since parabola opens downward, it has a max value, (the highest point) which occurs at the vertex.

Find the vertex (h, k): The formula for the x-coordinate of the vertex is:

$\boxed{x = \frac{-b}{2a}}$ $a=-2$, $b=4$

$x = \frac{-4}{2\cdot(-2)} = \frac{-4}{-4} = 1$.

Now find $h(1)$ to get the max. y-value:

$h(1) = -2(1)^2 + 4(1) - 9$

$= -2(1) + 4 - 9 = -2 + 4 - 9 = -7$. So the max value of $h(x)$ is -7.

Range: Since the parabola opens downward, $h(x)$ takes values at most -7, & it decreases toward $-\infty$ $(-\infty, -7]$

Answer: Domain $(-\infty, \infty)$

Range $(-\infty, -7]$

Farenheit

function

(y)

10. Find the domain of the following functions:

Date: $f(x) = \dfrac{x-4}{x^2-2x-15}$

1) The domain of a function includes all real numbers except where function is undefined.
For fractions, the function is undefined when the denominator is zero because the division by zero is not allowed.

2). Find where the Denominator is zero.
We set the denominator equal to zero & solve for x:

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

Solve by factoring: $(x-5)(x+3)=0$

Set each factor to zero: $x-5=0 \rightarrow x=5$

$x+3=0 \quad x=-3$

So function is undefined at $x=5$ & $x=-3$

3) Write the domain – The domain includes all real numbers except $x=5$ & $x=-3$ (Because the denominator will equal zero)

Domain in interval notation: $(-\infty,-3)\cup(-3,5)\cup(5,\infty)$

× Domain in set notation: $\{x\in\mathbb{R} \mid x\neq-3,\ x=5\}$

11. Evaluate the following piecewise-defined function for the given values of x, & graph the function:

$$f(x)=\begin{cases}-2x+1 & -1\le x<0\\ x^2+2 & 0\le x\le 2\end{cases}$$

?

$f(x)=-2x+1.$

x	f(x)
-1	3
0	1

D: $0\le x\le 2$

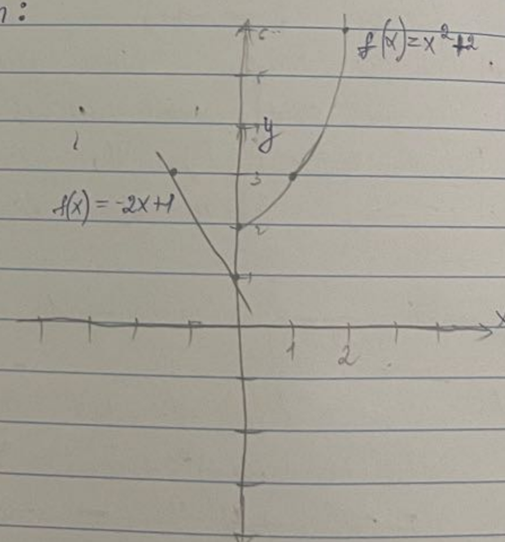
?

Как тут написать domain?

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

x	f(x)
0	2
1	3
2	6

Domain: $0\le x\le 2$?



(12) Find the slope of the line that passes through the points $(-1,2)$ & $(3,-4)$. Plot the points & graph the line.

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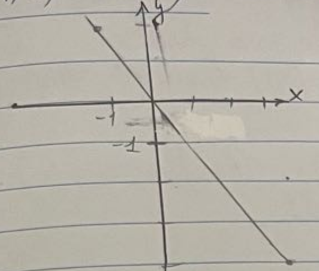
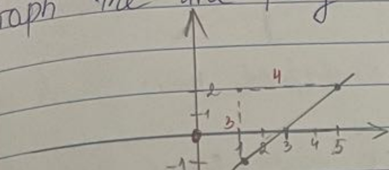


$m - ?$ $\quad m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$

$$\frac{-4-2}{3-(-1)} = \frac{-6}{4} = -\frac{3}{2}$$

(13). Graph the line passing through the point $(1,-1)$ whose slope is $m = \frac{3}{4}$



$m = \frac{\text{rise}}{\text{run}} = \frac{3}{4}$ $\quad$ rise $= 3$ (y)

run $= 4$ (x)

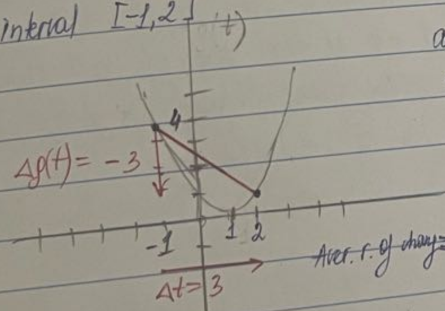
(15) Compute the average rate of change of $f(x) = x^2 - \frac{1}{x}$ on the interval $[2,4]$

$f(2) = 2^2 - \frac{1}{2} = 4 - \frac{1}{2} = \frac{8}{2} - \frac{1}{2} = \frac{7}{2}$ (OnenaTEA B solutions)

$f(4) = 4^2 - \frac{1}{4} = 16 - \frac{1}{4} = \frac{64}{4} - \frac{1}{4} = \frac{63}{4}$

The aver. range of change $\frac{f(4) - f(2)}{4-2} = \frac{\frac{63}{4} - \frac{7}{2}}{4-2} = \frac{\frac{49}{4}}{2} = \frac{49}{8}$

(14) Given the function $g(t)$ shown 1.3.1 find the average rate of change on the interval $[-1,2]$



at $t = -1$ $\quad g(-1) = 4$

at $t = 2$ $\quad g(2) = 1$

so the horizontal change $\Delta t = 3$

the vertical change $\Delta g(t) = -3$

Aver. r. of change $= \frac{1-4}{2-(-1)} = \frac{-3}{3} = -1$

(16). Given $f(t) = t^2 - t$ & $h(x) = 3x + 2$ evaluate $f(h(1))$

Because the inside expressions is $h(1)$ we start evaluating $h(x)$ at 1.

$h(1) = 3(1) + 2 = 5$.

Then $f(h(1)) = f(5)$ so we evaluate $f(t)$ at an input of 5. $f(h(1)) = f(5)$

$f(h(1)) = 5^2 - 5 = 20$

(17) Find the domain of $(f \circ g)(x)$ where $f(x) = \frac{5}{x-1}$ & $g(x) = \frac{4}{3x-2}$

Date:

?

It requires 2 steps:
1) Find the domain of $g(x)$ the inner function
2) Find the domain of $f(g(x))$ ensuring that $g(x)$ produces valid inputs for $f(x)$.

Step 1: Find the domain of $g(x)$. The function $g(x)\ \frac{4}{3x-2}$ is undefined where the denominator is zero:

$3x-2=0$

Solving for x; $x=\frac{2}{3}$ So D of $g(x)$ is all real numbers except $x=\frac{2}{3}$

Step 2: Find the domain of $f(g(x))$

~~The function $f(x) = \frac{5}{x}-1$ is underfined when its denominator is 0~~
~~$x=0$~~

Since we are evaluating $f(g(x))$ we must ensure that $g(x) \neq 0$

$\frac{4}{3x-2} \neq 0$. $4 \neq 0$.

So we need to exclude from the domain of $g(x)$ that value of x for which $g(x)=1$.

?

$\frac{4}{3x-2} = 1$

как так получилось?

$4 = 3x-2$

$6 = 3x$

$x=2$ So the d. of $f \circ g$ is the set of all real numbers except $\frac{2}{3}$ & 2. This means that $x \neq \frac{2}{3}$ or $x=2$.

Interval notation: $(-\infty, \frac{2}{3}) \cup (\frac{2}{3}, 2) \cup (2, \infty)$

(18.) Find & simplify the functions $(g-f)(x)$ & $\left(\frac{g}{f}\right)(x)$, given $\boxed{f(x)=x-1}$ & $\boxed{g(x) = x^2-1}$. Are they the same functions?

1) Find $(g-f)(x)$ to find this we substract $f(x)$ from $g(x)$

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

$(g-f)(x) = (x^2-1) - (x-1)$

$= x^2 - x$

$= x(x-1)$

1② Find $\left(\frac{g}{f}\right)x$ we decide $g(x)$ by $f(x)$.

$\frac{g}{f}(x) = \frac{g(x)}{f(x)} = \frac{x^2-1}{x-1} = \frac{\cancel{(x-1)}(x+1)}{\cancel{x-1}} = x+1.$ for $x \neq 1$!

When it's $x=1$ the denominator is $=0$, which makes the function undefined.

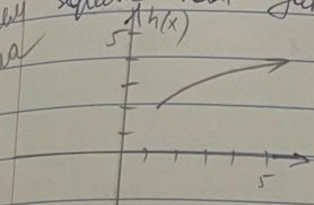
③ Are $(g \cdot f)(x)$ & $\left(\frac{g}{f}\right)(x)$ the same function?

$(g \cdot f)(x) = x^2 - x$

$\left(\frac{g}{f}\right)x = x+1$ (for $x \neq 1$)

Clearly $x^2 - x$ & $x+1$ are not the same function.

19. Write the formula for the graph shown, which is transform-n of the square root function.



$h(x) = f(x-1) + 2$

The graph of the function starts at the origin, so this graph has been shifted 1 to the right & up 2. In function notation, we could write that as $h(x) = f(x-1) + 2$.

Using the formula for the square root function, we can write ($f(x) = \sqrt{x}$)

$h(x) = \sqrt{x-1} + 2$

- This transformation has changed the domain & range of the function. This new graph has domain $[1, \infty)$ & range $[2, \infty)$

20. Write the formula for a transformation of the reciprocal function $f(x) = \frac{1}{x}$ that shifts the function's graph one unit to the right & 1 unit up.

- $f(x-1) = \frac{1}{x-1}$ shift the graph one unit to the right.
  why it's $x-1$ not $x+1$?
- $f(x) = \frac{1}{x-1} + 1$ one unit up. → Final Answer.

21. Is the function $f(x) = x^3 + 2x$ even, odd or neither?

1) Find $f(-x)$ → Replace x with $-x$ in the function & simplify.
2) Compare $f(-x)$ with $f(x)$ & $-f(x)$:
   if $f(-x) = f(x)$ the function is even.
   if $f(-x) = -f(x)$ the function is odd.
   if neither condition is met the function is neither even or odd.

$f(-x) = (-x)^3 + 2\cdot(-x) = -x^3 - 2x.$

$x^3 + 2x \neq -x^3 - 2x$

$-x^3 - 2x = -x^3 - 2x$ so it's odd.

B solution. $-f(-x) = -(-x^3 - 2x) = x^3 + 2x$ → so its odd.

какой из них правильный?

22. $f(s) = s^4 + 3s^2 + 7$ even, odd or neither.

Date: $f(-s) = (-s)^4 + 3\cdot(-s)^2 + 7 = s^4 + 3s^2 + 7$ So it's even.

Point–Slope Form of a Linear Equation → $y - y_1 = m(x - x_1)$

m – slope, x_1 & y_1 are the x & y coordinates of a specific point through which the line passes.

23. $(5,1)$ $(8,7)$ slope? Then rewrite it in the slope intercept form $y = mx + b$

$m = \frac{7-1}{8-5} = \frac{6}{3} = 2.$

We can take any of the points, & substitute

не хорошо поняла

$y - y_1 = m(x - x_1)$

$y - 1 = 2(x - 5)$ → point slope equation

$y - 1 = 2(x - 5)$

$y - 1 = 2x - 10$

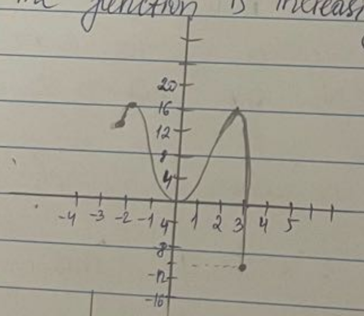
$y = 2x - 9$ → The slope intercept equation of the line

24. If $f(x)$ is a linear function, & $(3,-2)$ & $(8,1)$ are points on the line, find slope. Is this function increasing or decreasing.

$m = \frac{1-(-2)}{8-3} = \frac{3}{5} = 0.6.$

The function is increasing because $m > 0$.

25.



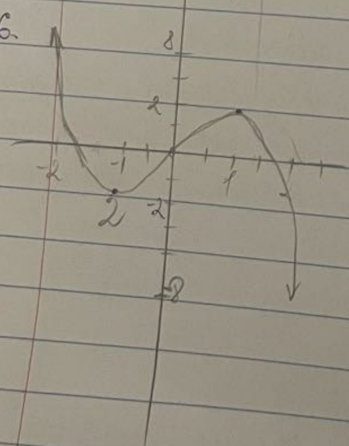
Как правильно оформить?

max 1 = $x = -2$ $y = 16$.

max 2 = $x = 2$

min = $x = 3$ $y = -10$

26.



Find the local $\begin{Bmatrix} max \\ min \end{Bmatrix}$

L. max = $x = 1$, $y = 2$

L. min = x -1 $y = -2$

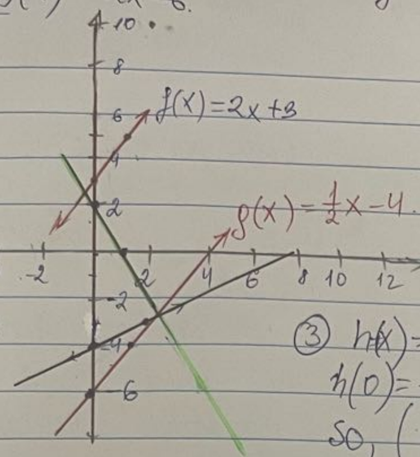
(27) $f(x)=2x+3$ $\quad h(x)=-2x+2$ — identify whose graph are a pair of perpendicular lines

$g(x)=\frac{1}{2}x-4$ $\quad j(x)=2x-6.$

use formula: $\boxed{y=mx+b}$

$m=$ slope

$b=y$ intercept



① $f(0)=2\cdot0+3=3$ (y)

$\to$ So, $(0,3)$ $\to$ gives $(1,5)$

② $g(0)=\frac{1}{2}\cdot0-4=-4$

So $(0,-4)\to(2,-3)$

slop $\frac{1}{2}$ means Rise $=1$ (move up 1unit)

Run $=2$ (move right 2units)

③ $h(x)=-2x+2$

$h(0)=-2\cdot0+2=2$

So, $(0,2)\longrightarrow$

④ $j(x)=2x-6$

$j(0)=2\cdot0-6=-6.$

So $(0,-6)\to($

Answer: $f(x)=2x+3$ & $j(x)=2x-6$ are parallell

$g(x)=\frac{1}{2}x-4$ & $h(x)=-2x+2$ are perpendicular.

(28) $\begin{cases}2x+y=7\\ x-2y=6\end{cases}$ $\longrightarrow$ ① let solve one of the equations for y.

$2x+y=7$

$y=7-2x.$

② substitute. Replace y in other equation.

$x-2y=6\to x-2(7-2x)=6.$

$x-14+4x=6$

$5x=20$

$x=4.$

③ Now replace x with 4

$2x+y=7$

$2\cdot4+y=7$

$8+y=7$

$y=-1$

$(4,-1)$ you can subst. $x=4$, $y=-1$ into both equ-ns & make sure they are both true.

(29) $\begin{cases}4x+2y=4\\ 6x-y=8\end{cases}$ (solve for y) $4x+2y=4$

$2y=-4x+4$

$y=-2x+2$

(substitute for 2nd) $6x-(-2x+2)=8$

$6x+2x-2=8$

$8x=10$

$x=\frac{10}{8}$

$x=\frac{5}{4}$ $\longrightarrow$

$4x+2y=4$

$4\cdot\frac{5}{4}+2y=4$

$5+2y=4$

$2y=-1$

$y=-\frac{1}{2}$

Substitute for both equations:

$4x+2y=4$

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

$5-1=4$

$4=4$ ✓

Ordered pair is $\frac{5}{4}; -\frac{1}{2}$

$6x-y=8$

$6\left(\frac{5}{4}\right)-\left(-\frac{1}{2}\right)=8$

$\frac{15}{4}-\left(-\frac{1}{2}\right)=8$

$\frac{16}{2}=8$

$8=8$ ✓

Forms of Quadratic Functions

— the graph is parabola

The general form of a quadratic function is $f(x)=ax^2+bx+c$ where $a, b, \& \ c$ are real numbers & $a \neq 0$

The standard form of a quadratic function is $f(x)=a(x-h)^2+k$

The vertex (h,k) is located at $h=-\frac{b}{2a}$ $k=f(h)=f\left(\frac{-b}{2a}\right)$

(30) Given a quadratic function in general form, find the vertex of the parabola.

1. Identify $a, b \ \& \ c$
2. Find h, the x-coordinate of the Vertex, by substituting $a \ \& \ b$ into $h=-\frac{b}{2a}$
3. Find k, the y-coordinate of the vertex, by evaluating $k=f(h)=f\left(-\frac{b}{2a}\right)$

• $f(x)=ax^2+bx+c$ $\quad 2x^2-6x+7$

1) $a=2$ $\quad b=-6$ $\quad c=7$

2). $h=-\frac{b}{2a}$ $\quad h=-\frac{-6}{2\cdot 2}=-\frac{-6}{4}=\frac{6}{4}=\frac{3}{2}$ or $1{,}5$.

(30.1) Find the vertex of the quadratic function $f(x)=2x^2-6x+7$
Rewrite the quadratic in standard form (vertex form).

Date:

S: As with any quadratic function, the domain is all real numbers.

1) Identify coefficients
$a=2 \quad b=-6 \quad c=7$

2) Find h, the x-coordinate of the vertex. $h=\frac{-b}{2a}$

Substitude: $h=\frac{-(-6)}{2\cdot 2}=\frac{6}{4}=1.5$ or $\frac{3}{2}$ So the x-coordinate of the vertex is $h=1.5$ or $\frac{3}{2}$

3) Find k, the y-coordinate of the vertex. (the highest or the lowest point on its graph)
(min point) $a>0$ parabola upward
$a<0$ downward. (max point)

Substitude $h=1.5$ into $f(x)$

$k=f(1.5)=2(1.5)^2-6(1.5)+7$
$=2(2.25)-9+7$
$=4.5-9+7=2.5$
So, $k=2.5$.

So the answer is the vertex of the function is: $(1.5, 2.5)$ or $\left(\frac{3}{2}, 2\frac{1}{2}\right)$

$f(x)=2\left(x-\frac{3}{2}\right)^2+\frac{5}{2}$

$f(x)=-5x^2+9x-1$

(31) 1) As with any quadratic function, the domain is all real numbers.
2) a is negative, the parabola opens downward, & has max. value. We have to find the max. value. Lets begin with finding the x-value of the vertex. $h=-\frac{b}{2a}$

$h=-\frac{9}{2\cdot(-5)}=\frac{9}{10}$. ~~кажется~~ опечатка? минуса на b solutions

max $f(h)=f\left(\frac{9}{10}\right)=-5\left(\frac{9}{10}\right)^2+9\left(\frac{9}{10}\right)-1$

$=-5\cdot\frac{81}{100}+\frac{81}{10}-1$

$=-\frac{81}{20}+\frac{81}{10}-1$

$=\frac{-81+162}{20}-1=\frac{81}{20}-1=\frac{81-20}{20}=\frac{61}{20}$

or $=-4.05+8.1-1=3.05$ or $\frac{61}{20}$

The range is $f(x)\le\frac{61}{20}$ or $\left(-\infty, \frac{61}{20}\right]$

$f(1)=8$
$=8$
8
$2H$
ax^2+bx+c
$(x-h)^2+k$
$-\frac{b}{2a}$
the vertex
b into $h=-\frac{b}{2a}$
$\frac{b}{2a}$
1,5.

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

Date: find y & x intercepts

1) Evaluate $f(0)$ to find the y-intercept
2) Solve the quadratic equation $f(x) = 0$ to find the x-inter

$f(0) = 3 \cdot 0^2 + 5 \cdot 0 - 2 = -2$

So y intercept is at $(0, -2)$!

For the x-intercepts, we find all solutions of $f(x) = 0$.

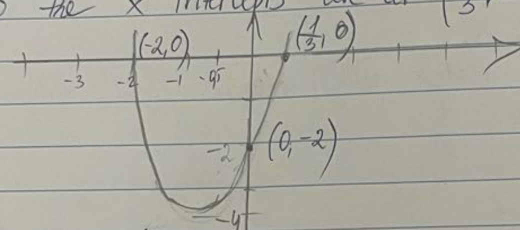
$0 = 3x^2 + 5x - 2$

$0 = (3x-1)(x+2)$

?

$0 = 3x - 1$ — $x = \frac{1}{3}$ or $0 = x + 2$, $x = -2$

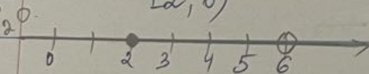
So the x intercepts are at $(\frac{1}{3}, 0)$ and $(-2, 0)$



33. Solve the inequality, graph the solution set on a number line & show the solution set in interval notation:

a) $-1 \le 2x - 5 < 7$
b) $x^2 + 7x + 10 < 0$
c) $-6 < x - 2 < 4$

$[2, 6)$



a) $-1 \le 2x - 5 < 7$

The goal is to isolate the variable x, so start adding 5 to all 3 regions.

$-1 + 5 \le 2x - \cancel{5} + \cancel{5} < 7 + 5$

$4 \le 2x < 12$ Then divide all by 2 to isolate x

$2 \le x < 6$

b) $x^2 + 7x + 10 < 0$

$(x+5)(x+2) < 0$

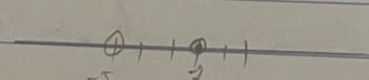
if $(x+5) < 0$ then $(x+2) > 0$

$(x+5) > 0 \cup (x+2) < 0$ — find the intersection of each of these inequat.

$x > -5 \cup x < -2$

$-5 < x < -2$

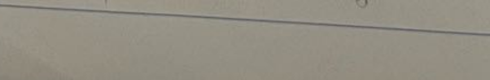
$(-5, -2)$



c) $-6 < x - 2 < 4$ (+2, +2, +2)

$-4 < x < 6$

$(-4, 6)$



(34) Solve the inequality & graph the solution set. State the answer in both set builder notation & in interval notation.

$10-(2y+1) \le -4(3y+2)-3$

$10-2y-1 \le -12y-8-3$

$-2y+9 \le -12y-11$

$-2y \le -12y-20$

$10y \le -20$

$y \le \frac{-20}{10}$

$y \le -2$

Set builder notation: $\{y \mid y \le -2\}$ (such that)

Interval notation: $(-\infty, -2]$

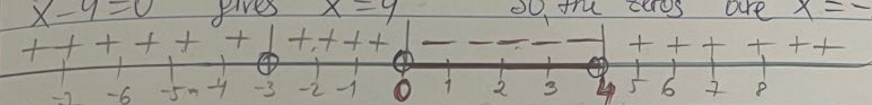
(35) Solve $x(x+3)^2(x-4)<0$

(1) Identify the zeros.

$x=0$

$(x+3)^2=0$ gives $x=-3$

$x-4=0$ gives $x=4$ So, the zeros are $x=-3, 0$ & 4.



4 regions Test values in each region if its + or −. We choose $-5, -1, 2$ & 6. We are concerned only with the sign + or − of the result.

$f(-5) = -5(-5+3)^2(-5-4) = -\,-^2\,- = +$

$f(-1) = -1(-1+3)^2(-1-4) = -\,+^2\,- = +$

$f(2) = 2(2+3)^2(2-4) = +\,+^2\,- = -$

$f(6) = 6(6+3)^2(6-4) = +\,+^2\,+ = +$

The ? is where $f(x)<0$ or where the function is negative.

So the answer is $(0, 4)$.

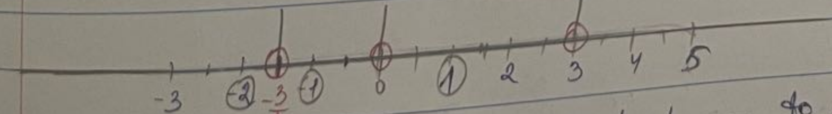
(36) Solve $2x^4 > 3x^3 + 9x^2$ Obtain 0 on 1 side

$2x^4 - 3x^3 - 9x^2 > 0$ Substract to obtain a polynomyal

$x^2(2x^2-3x-9)=0$ — Надо вспомнить формулу!

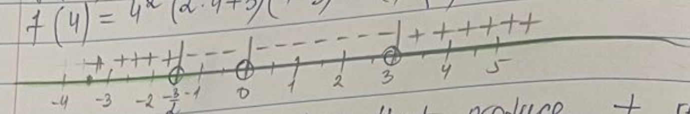
$x^2(2x+3)(x-3)=0$

critical numbers: $-\frac{3}{2}, 0, 3$



Use: $x^2(2x+3)(x-3)$ test values $-2, -1, 1$ — to determine the sign.

$f(-2) = (-2)^2(2(-2)+3)(-2-3) = (-)^2 - - = +$
$f(-1) = (-1)^2(2(-1)+3)(-1-3) = (-)^2 + - = -$
$f(+1) = 1^2(2\cdot 1+3)(1-3) = (+)^2(+) - = -$
$f(4) = 4^2(2\cdot 4+3)(4-3) = (+)^2(+)(+) = +$



The ? is $f(x)>0$. values that produce + results
Answer $(-\infty, -\frac{3}{2}) \cup (3, \infty)$

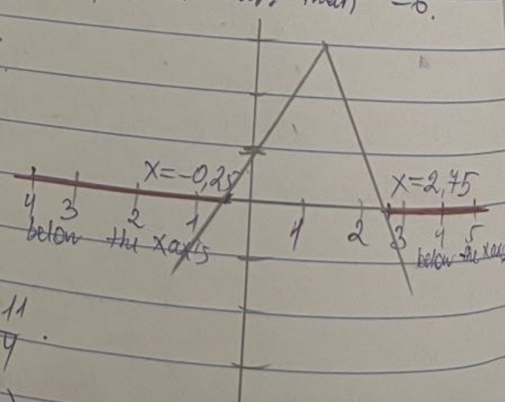
38 Solve $13-2|4x-7| \leq 3$
$-2|4x-7| \leq -10$ (dividing by - number reverses the inequality
$|4x-7| \geq 5$

$4x-7 \leq -5$ or $4x-7 \geq 5$
$4x \leq 2$ $4x \geq 12$
$x \leq \frac{1}{2}$ $x \geq 3$

$(-\infty, \frac{1}{2}] \cup [3, \infty)$

37 $f(x) = -\frac{1}{2}|4x-5|+3$ determine the x values for which the function values are negative.
We have to determine where $f(x)<0$
$-\frac{1}{2}|4x-5|+3<0$
$-\frac{1}{2}|4x-5| < -3$
$|4x-5| \geq 6$ - means that the expression inside the absolute value is either greater than 6 or less than -6.

$4x-5=6$ $4x-5=-6$
$4x=11$ $4x=-1$
$x=\frac{11}{4}$ $x=-\frac{1}{4}$
$x=2\frac{3}{4}$ $x=-0,25$
$x=2,75$



It's below the x axis left of $x=-\frac{1}{4}$ & right of $x=\frac{11}{4}$.
$x<-\frac{1}{4}$ or $x>1\frac{1}{4}$
The interval notation $(-\infty, -0,25) \cup (2,75, \infty)$