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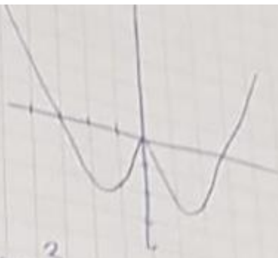
Calculus 1 HW 5

1. 4 $x_1 = -3$, $x_2 = 0$, $x_3 = 3$

on y-axis $f(0) = 0$



$x \in \mathbb{R}$

local min. is by $-\frac{9}{4}$ and $x = \frac{3}{2}$

or $x = -\frac{3}{2}$

local max. is by 0 by $x = 0$

$f'(x) = 2x - \frac{3x}{|x|}$

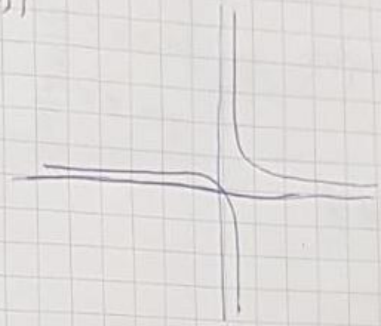
No horizontal asymptote

it is continuous and even

12. $x = 0$ $x \in \mathbb{R} \setminus \{\ln(2)\}$

$y = f(0) = 0$

$f^{-1}(x) = \ln\left(\frac{-2x+1}{1-x}\right)$



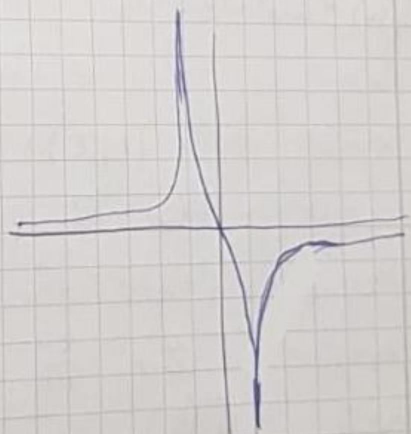
$f'(x) = -\frac{e^x}{(e^x-2)^2}$

no extrem number

horizontal asymptote by $y = 1$ or $y = \frac{1}{2}$

It is not even/odd

16. $x = 0$ $x \in \mathbb{R} \setminus \{-1, 1\}$



$f(0) = 0$ $f'(x) = \frac{2}{x^2-1}$

horizontal asymptote by $y = 0$

18. $x_1 = -\frac{1}{2},\ x_2 = 0$

$y = f(0) = 0$

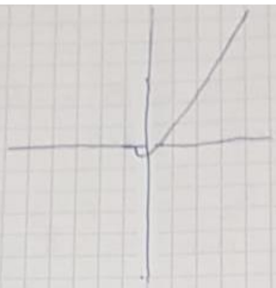
$x \in [-\frac{1}{2}, +\infty)$

$f'(x) = \frac{3x+1}{\sqrt{2x+1}}$

no vertical asymptote

no horizontal asymptote

not even/odd



23. $f(0) = 0$

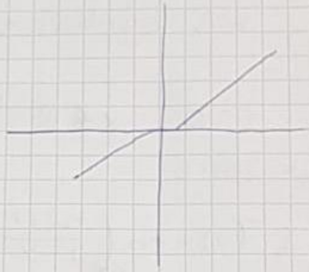
$x \in \mathbb{R}$ $\quad f'(x) = 1 - \frac{1}{1+x^2}$

no horizontal asymptote

asymptote by $y = x - \frac{\pi}{2}$

$y = x + \frac{\pi}{2}$

is odd



26 $2x^3 - 9x^2 + 12x - 2$

$f'(x) = 6x^2 - 18x + 12 \quad x \in \mathbb{R}$

$0 = 6x^2 - 18x + 12$

$x = 1 \quad = (-\infty, 1) \cup (1, 2)$

$x = 2 \quad = (1, 2) \cup (1, +\infty)$

$x_1 = 0 \quad = f'(0) = 12$

$x_2 = \frac{11}{10} \quad = f'(\frac{11}{10}) = -\frac{27}{50} \quad f(x) = 2x^3 - 9x^2 + 12x - 2,\ x = 1 \quad = f(1) = 5$

$x_3 = \frac{11}{10} \quad = f'(\frac{11}{10}) = -\frac{27}{50} \quad f(x) = 2x^3 - 9x^2 + 12x - 2,\ x = 2 \quad = f(2) = 2$

$x_4 = 3 \quad = f'(3) = 12$

local max. is by 3 by $x = 1$

local min. is by 2 by $x = 2$

2d. ① a. $f(x) = x - \ln(x), \; x \in (0{,}5, 4)$

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

$0 = 1 - \frac{1}{x}$

$x = 1$

$f(1) = 1 \qquad (0{,}5, 1), (1, 4)$

$x_1 = \frac{1}{10} \quad = f'(\frac{1}{10}) = -9$

$x_2 = 2 \quad = f'(2) = \frac{1}{2}$

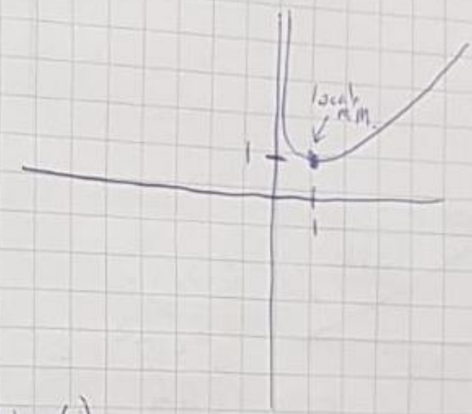
$f(x) = x - \ln(x), \; x = 1$

$f(1) = 1$

local min. is by 1 by $x = 1$

there is no local max.!

b. no local min.
and max.



⑪ a. $f'(x) = 1 - \frac{1}{x}$

$0 = 1 - \frac{1}{x}$

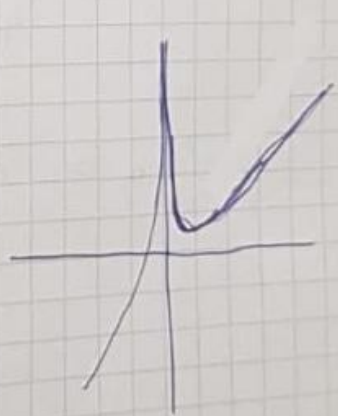
$x = 1 \qquad (0{,}5, 1), (1, 4)$

same equation like above ①a.

$f(1) = 1$

local min. is by 1 by $x = 1$

b. there is no min. or max



3a2. $\arctan x - e^{-x} = 3$

$= \arctan(x - e^{\frac{1}{x}}) = 3$

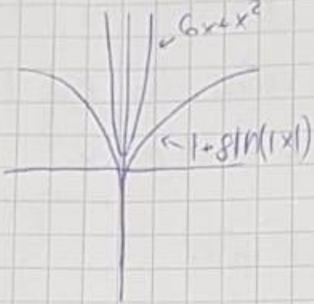
because $\arctan(x - \frac{1}{e^{x}}) \in [-\frac{\pi}{2}, \frac{\pi}{2}]$

does not have any solution $x \in \emptyset$

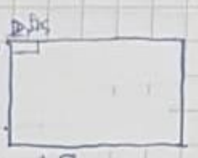
c1. $1 + 8\ln x = 6x + x^2$

no solution $x \in \emptyset$

c2. no solution



4b.



$8 \cdot 18$

88

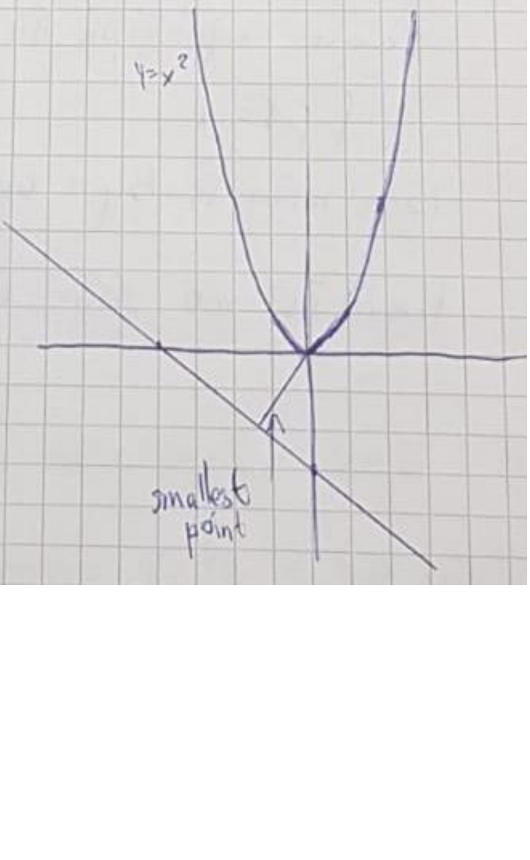
64

area = 144

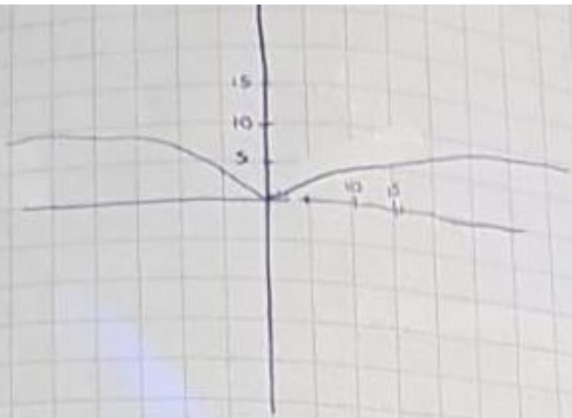
f.

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

it will be on $x = 0$



5a.



7a.

b. $f'(x) = \frac{1}{\sqrt{x^2+k}}$

c. $f(x) = \ln\left(x + \sqrt{x^2+k}\right)$

$y = \ln\left(x + \sqrt{x^2+k}\right)$

$x = \ln\left(y + \sqrt{y^2+k}\right) \quad | -\ln$

$-\ln(x) = y + \sqrt{y^2+k} \quad | ^2$

$-\ln(x)^2 = y^2 + \left(\sqrt{y^2+k}\right)^2 \quad | \sqrt{\ }$

$-\ln(x) = 2y + \sqrt{k} \quad | -\sqrt{k}$

$-\ln(x) - \sqrt{k} = 2y \quad | :2$

$\frac{\left(-\ln(x) - \sqrt{k}\right)}{2} = y$

$f^{-1}(x) = \frac{-\ln(x) - \sqrt{k}}{2}$