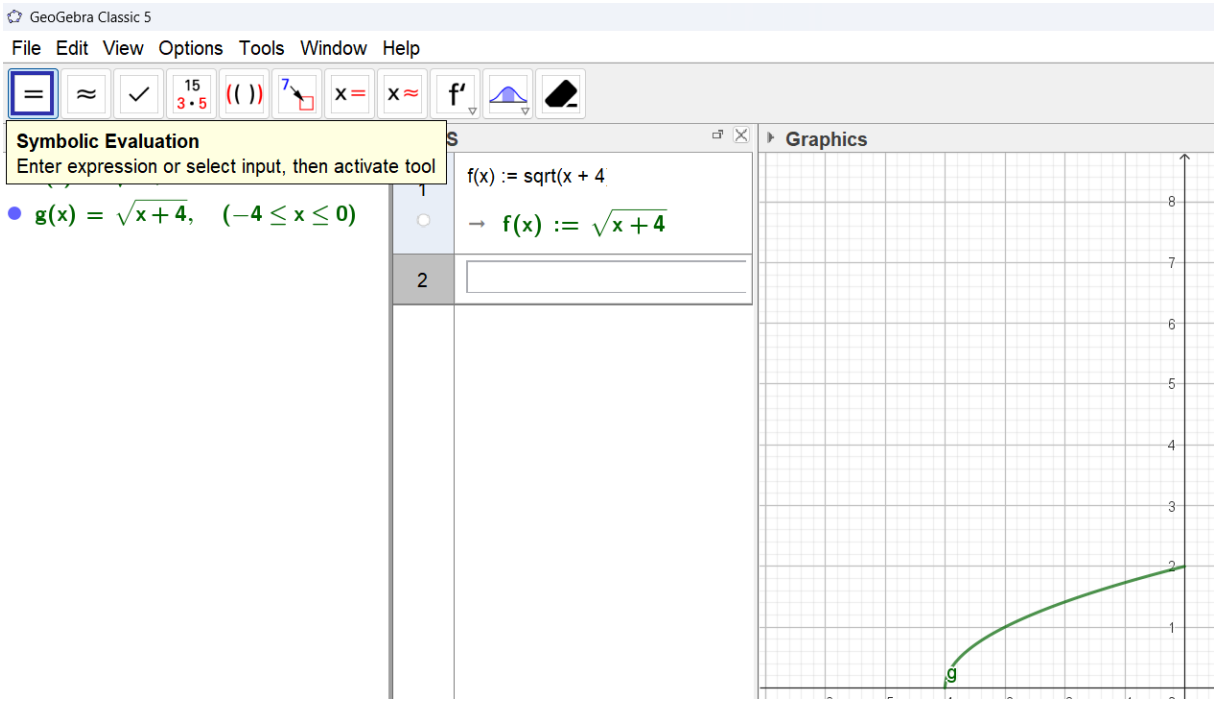
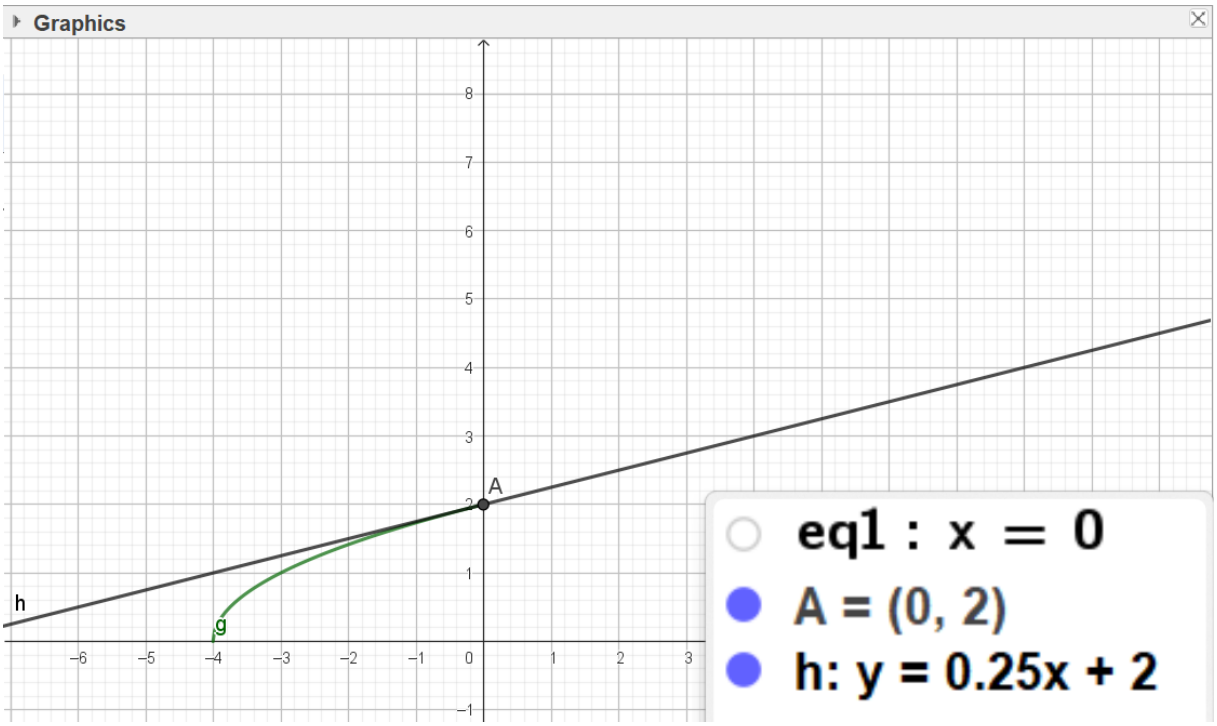
MAT104 Obligatorisk innlevering 3

Oppg 1

a)



b)



c)

- **h: y = 0.25x + 2**
- **w(x) = 0.25 x + 2**

3	w(0) ≈ **2**
4	√3.96 ≈ **1.99**

Svar = 2

d)

5	(x,0.25x+2)=(x,f(x)) Solve: **{x = 0}**

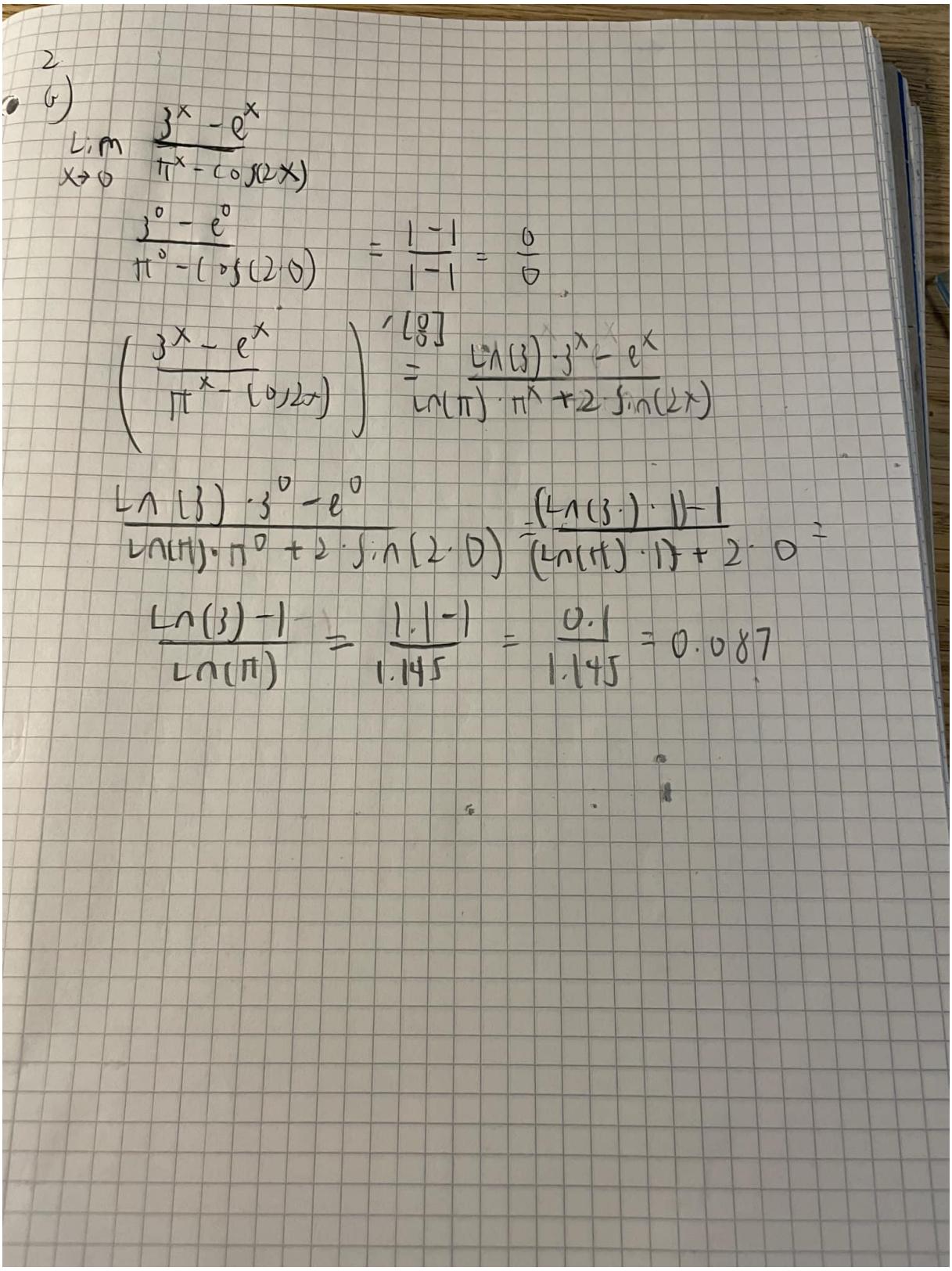
~~x=0?~~

~~Usikker~~ – FEIL

Sett f’(x) = «stiningstall»

0.25 er ikke rett så er tangenten feil?

Oppg 2



Løsning= 0.087?

3)

$$\lim_{x\to 1} \frac{\ln x}{x^2-1} = \frac{\ln(1)}{1^2-1} = \frac{0}{0}$$

$\left[\frac{0}{0}\right]$

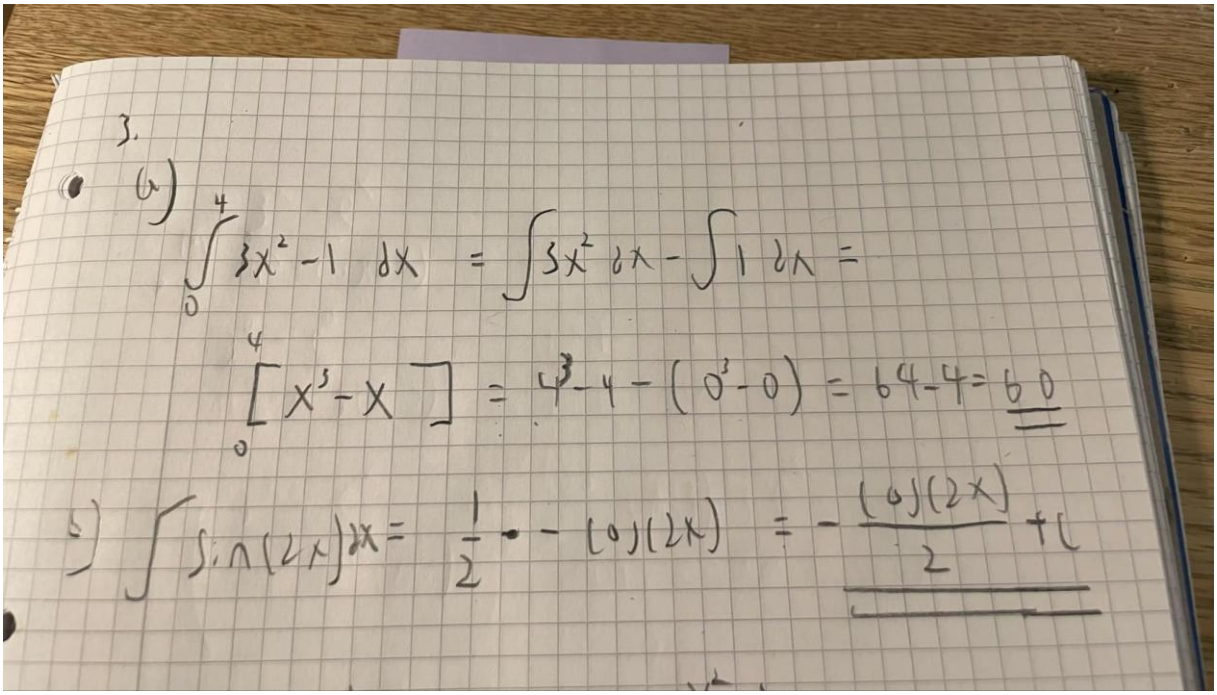
$$\left(\frac{\ln x}{x^2-1}\right)' = \frac{\frac{1}{x}}{2x-0}$$

$$\lim_{x\to 1} \frac{\frac{1}{x}}{2x} = \frac{1}{\frac{1}{2\cdot 1}} = \frac{1}{2}$$

4) $\lim_{x\to\infty} \frac{x^2}{e^x+x^2}$ $\left[\frac{\infty}{\infty}\right]$ $= \frac{2x}{e^x+2x}$ $\left[\frac{\infty}{\infty}\right]$ $= \frac{2}{e^x+2}$

$$\frac{2'}{e^{\infty}+2} = \frac{2}{\infty} = \frac{0}{1}$$

Oppg 3



Oppg 4

a)

Δx = (b-a)/n

((π/4)-0)/4 = π/16

T_n = Δx/(π/16) [f(x_0), (π/16)*f(x_1), (π/16)*f(x_2), (π/16)*f(x_3), ...), f(x_n)]

b)

Sjekk boken.

Δx = (b-a)/n

$\Delta x = \frac{\left(\frac{\pi}{4}\right)-0}{n}$

$$\int_0^{\frac{\pi}{4}} f(x)\,dx = \left(\frac{2}{\Delta x}\right)\left[f(x_0) + \mathrm{f}(x_n) + 2\sum_{i=0}^{n-1} \mathrm{f}(n_i)\right]$$

$$= \left(\frac{2}{\Delta x}\right)\left[f(\mathrm{a}) + \mathrm{f}(b) + 2 * \sum_{i=0}^{n-1} \mathrm{f}(\mathrm{x} + \mathrm{i} * \Delta x)\right]$$

c)

```java
public class oppgave4 {
    static double trapesHoyder;
    public static void main(String[] args) {
        double startVerdi = 0;
        double sluttVerdi = (Math.PI/4);

        double antallTrapeser = 25;
        double deltax = finnDelta_X(antallTrapeser);
        trapesHoyder = f(startVerdi)+f(sluttVerdi);
        for (int i = 0; i < antallTrapeser; i++) {
            trapesHoyder = trapesHoyder + 2*f(startVerdi+i*deltax);
        }
        double trapessum = (deltax/2)*trapesHoyder;
        System.out.println(trapessum);

    }
    public static double f(double x) {
        double f_av_x = (2*Math.pow(x,2))+x+5; //Må kunne endres til hva som helst annen funksjon slik koden fungerer enda.
        return f_av_x;
    }
    public static double finnDelta_X(double n) {
        double delta_x = (((Math.PI/4)-0)/n); //Må kunne endres til hva som helst annen funksjon slik koden fungerer enda.
        return delta_x;
    }

}
```

```
<terminated> oppgave4 [Java Application] C:\Users\filiu\Downloads\eclipse-java-2024-06-R-v
4.7157360215929
```

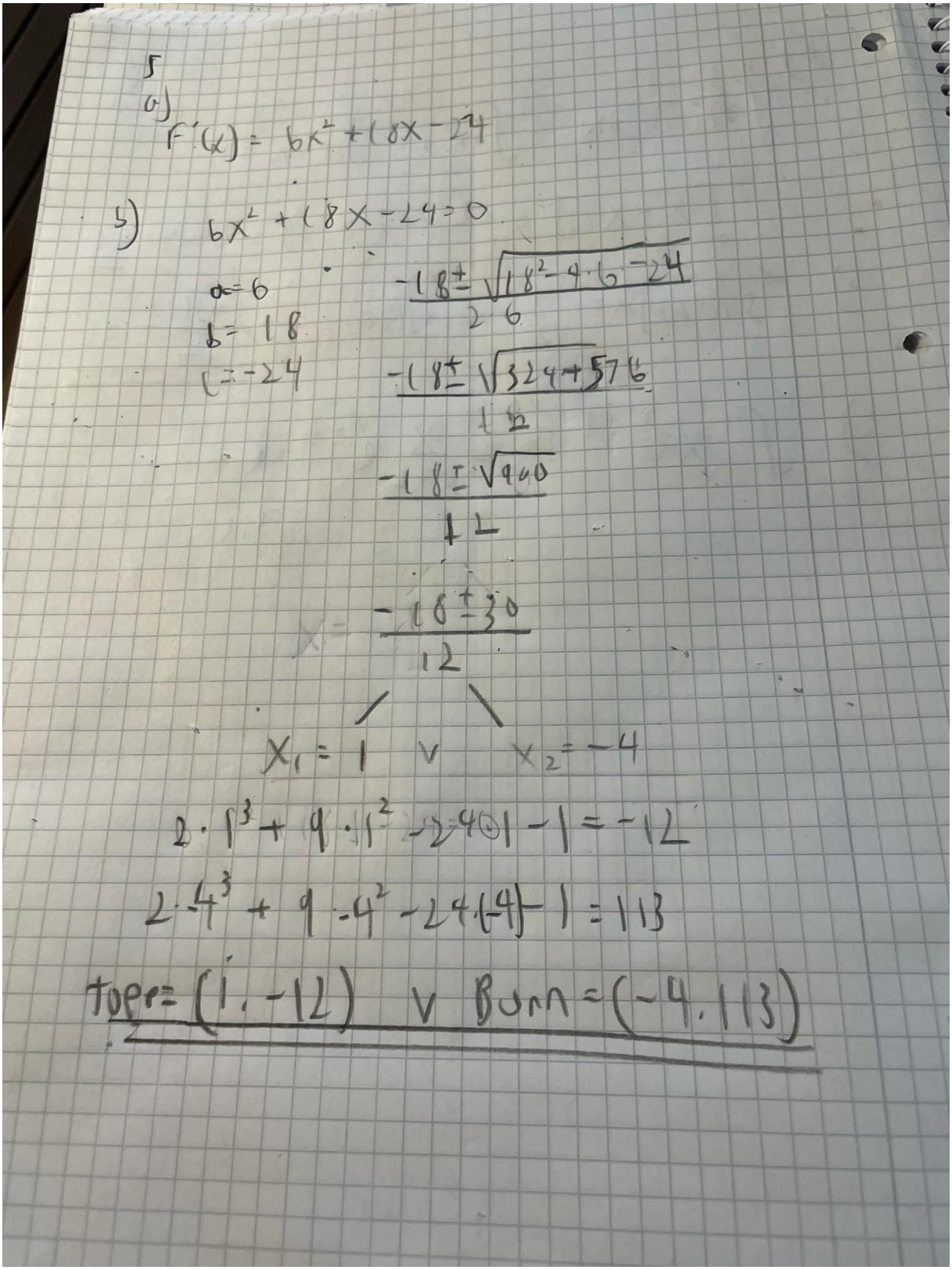
```java
public class oppgave4 {
    static double trapesHoyder;
    public static void main(String[] args) {
        double startVerdi = 0;
        double sluttVerdi = (Math.PI/4);

        double antallTrapeser = 25;
        double deltax = finnDelta_X(antallTrapeser);
        trapesHoyder = f(startVerdi)+f(sluttVerdi);
        for (int i = 0; i < antallTrapeser; i++) {
            trapesHoyder = trapesHoyder + 2*f(startVerdi+i*deltax);
        }
        double trapessum = (deltax/2)*trapesHoyder;
        System.out.println(trapessum);

    }
    public static double f(double x) {
        double f_av_x = (1/x); //Må kunne endres til hva som helst annen funksjon slik koden fungerer enda.
        return f_av_x;
    }
    public static double finnDelta_X(double n) {
        double delta_x = (((Math.PI/4)-0)/n); //Må kunne endres til hva som helst annen funksjon slik koden fungerer enda.
        return delta_x;
    }

}
```

```
<terminated> oppgave4 [Java Application] C:\Users\filiu\Downloads\eclipse-java-2024-06-R-w
Infinity
```

```java
public class oppgave4 {
    static double trapesHoyder;
    public static void main(String[] args) {
        double startVerdi = 0;
        double sluttVerdi = (Math.PI/4);

        double antallTrapeser = 25;
        double deltax = finnDelta_X(antallTrapeser);
        trapesHoyder = f(startVerdi)+f(sluttVerdi);
        for (int i = 0; i < antallTrapeser; i++) {
            trapesHoyder = trapesHoyder + 2*f(startVerdi+i*deltax);
        }
        double trapessum = (deltax/2)*trapesHoyder;
        System.out.println(trapessum);

    }
    public static double f(double x) {
        double f_av_x = Math.pow(x, 2)+x+7; //Må kunne endres til hva som helst annen funksjon slik koden fungerer enda.
        return f_av_x;
    }
    public static double finnDelta_X(double n) {
        double delta_x = (((Math.PI/4)-0)/n); //Må kunne endres til hva som helst annen funksjon slik koden fungerer enda.
        return delta_x;
    }

}
```

```
<terminated> oppgave4 [Java Application] C:\Users\filiu\Downloads\eclipse-java-2024-06-R-wi
6.187743984263529
```

Oppg 5



5

a)

$f'(x) = 6x^2 + 18x - 24$

b) $6x^2 + 18x - 24 = 0$

$a = 6$

$b = 18$

$c = -24$

$$\frac{-18 \pm \sqrt{18^2 - 4 \cdot 6 \cdot -24}}{2 \cdot 6}$$

$$\frac{-18 \pm \sqrt{324 + 576}}{12}$$

$$\frac{-18 \pm \sqrt{900}}{12}$$

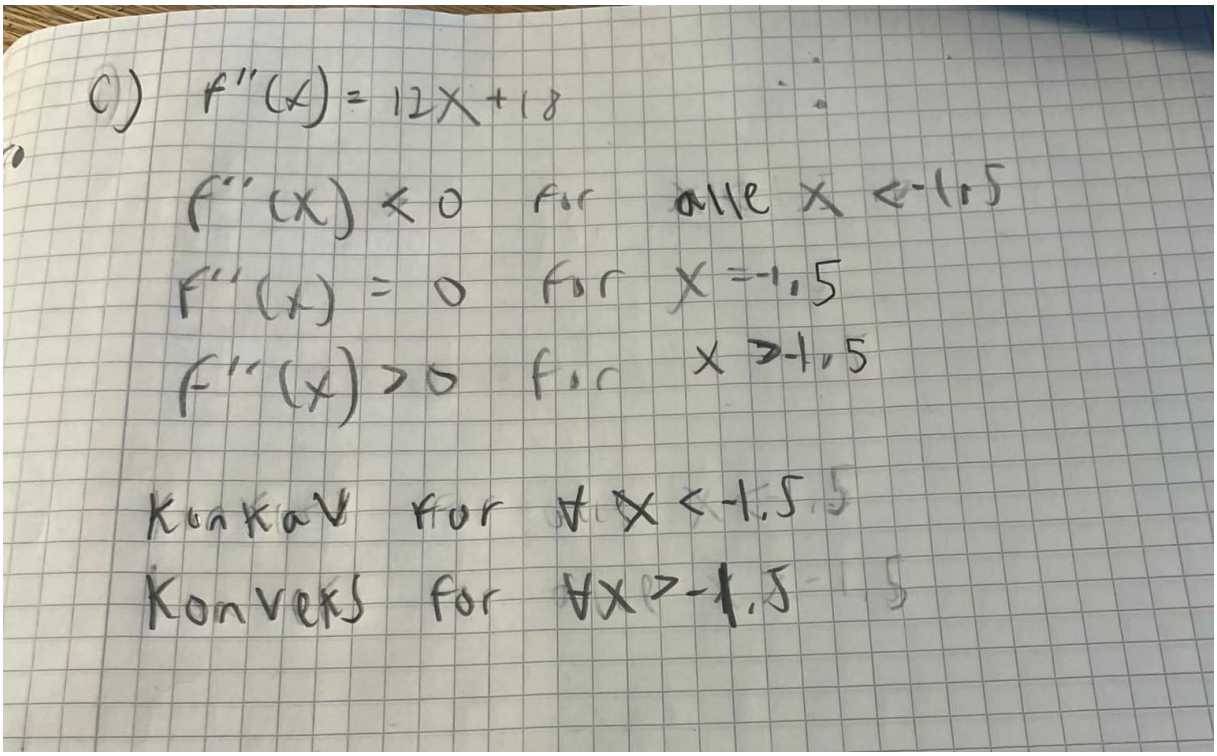
$$\frac{-18 \pm 30}{12}$$

$x_1 = 1 \quad \vee \quad x_2 = -4$

$2 \cdot 1^3 + 9 \cdot 1^2 - 24 \cdot 1 - 1 = -12$

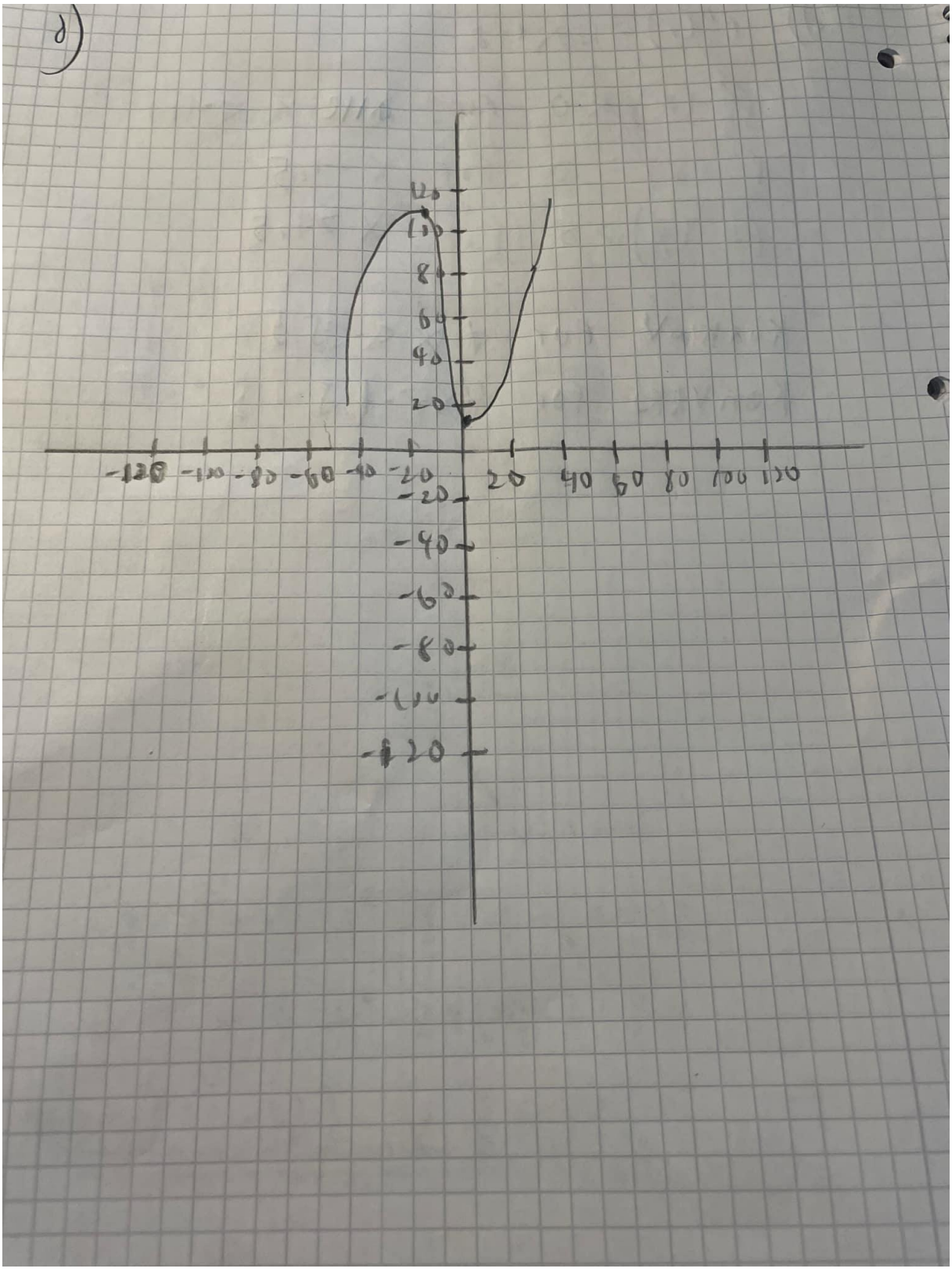
$2 \cdot -4^3 + 9 \cdot -4^2 - 24 \cdot (-4) - 1 = 113$

Topp = $(1, -12)$ $\vee$ Bunn = $(-4, 113)$

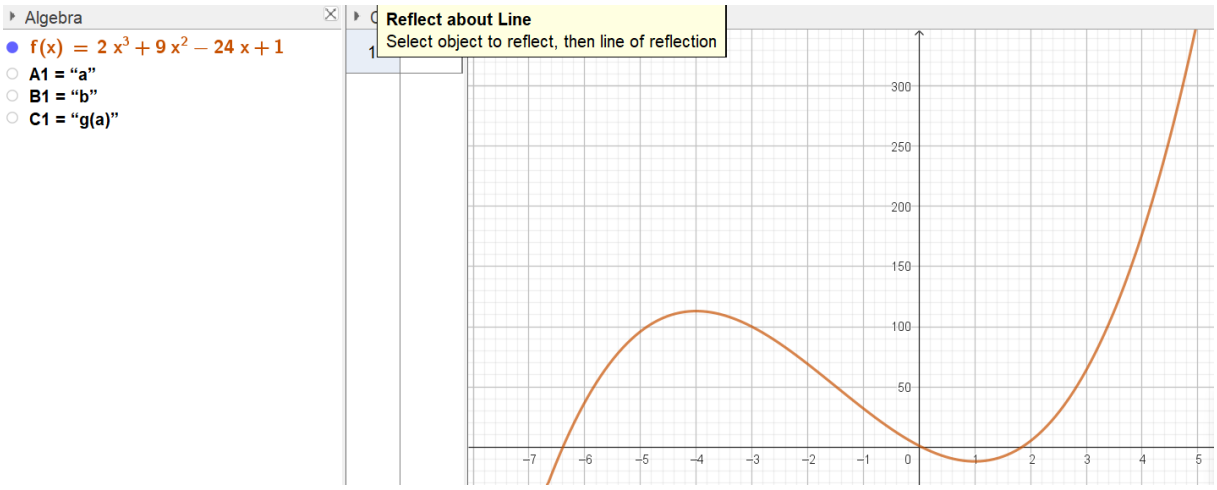


~~f''(x) er en linærfunksjon som vil alltids øke pga positiv stigningstall. Er verken konveks eller konkav. Stigningspunkt blir 0?~~

d)


120
100
80
60
40
20
-120 -100 -80 -60 -40 -20 20 40 60 80 100 120
-20
-40
-60
-80
-100
-120

e)



	A	B	C	D
1	a	b	g(a)	g(b)
2	-7	3	-76	64
3	-6.5	3	-12	64
4	-6	3	37	64
5	-5.5	3	72.5	64
6	-5	3	96	64
7	-4.5	3	109	64
8	-4	3	113	64
9	-3.5	3	109.5	64
10	-3	3	100	64
11	-2.5	3	86	64
12	-2	3	69	64
13	-1.5	3	50.5	64
14	-1	3	32	64
15	-0.5	3	15	64
16	0	3	1	64
17	0.5	3	-8.5	64
18	1	3	-12	64
19	1.5	3	-8	64
20	2	3	5	64
21	2.5	3	28.5	64

Summen for y for verdier av f(a) «g(a) i tabell» gjør at når a øker vil y verdien bytter fortegn 3 ganger. Først negativt, så positivt, så negativt så positivt igjen. Det må også være 3

punkt på y mellom: g(a) = -12 v g(a) = 37, g(a) = 1 v g(a) -8.5 og g(a) = -8 v g(a) = 5 som blir 0 for y.

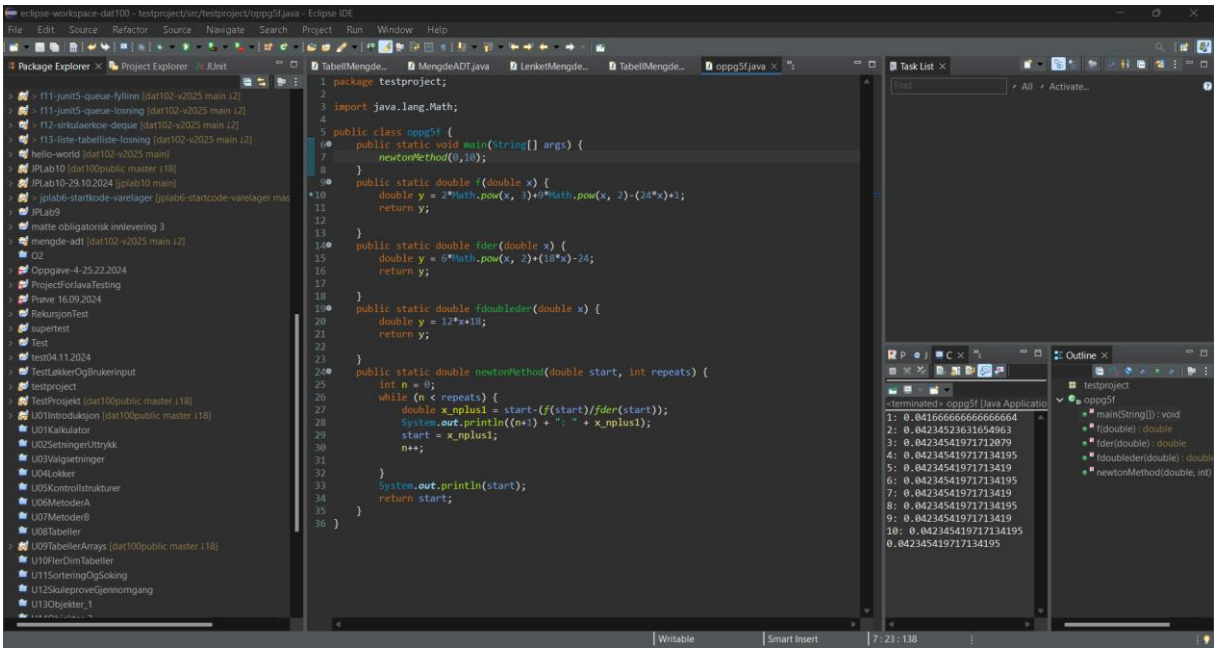
Så den må gå igjennom 0 på y aksen 3 ganger og dermed har 3 nullpunkt på y aksen.

f)

```java
package testproject;

import java.lang.Math;

public class oppg5f {
    public static void main(String[] args) {
        newtonMethod(-2,10);
    }
    public static double f(double x) {
        double y = 2*Math.pow(x, 3)+9*Math.pow(x, 2)-(24*x)+1;
        return y;

    }
    public static double fder(double x) {
        double y = 6*Math.pow(x, 2)+(18*x)-24;
        return y;

    }
    public static double newtonMethod(double start, int repeats) {
        int n = 0;
        while (n < repeats) {
            double x_nplus1 = start-(f(start)/fder(start));
            System.out.println((n+1) + ": " + x_nplus1);
            start = x_nplus1;
            n++;

        }
        System.out.println(start);
        return start;
    }
}
```

```
<terminated> oppg5f [Java Applicatio
1: -0.08333333333333326
2: 0.03691580287324969
3: 0.042333752007324595
4: 0.04234541966289611
5: 0.042345419717134195
6: 0.04234541971713419
7: 0.042345419717134195
8: 0.04234541971713419
9: 0.042345419717134195
10: 0.04234541971713419
0.04234541971713419
```

g)

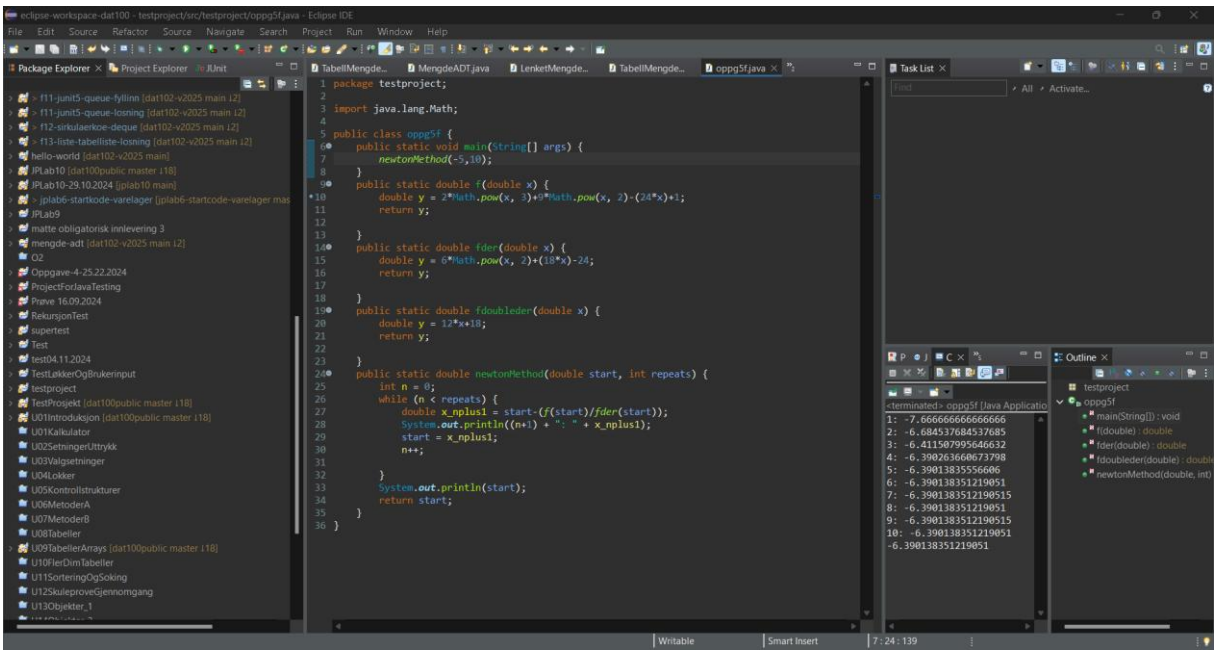


(0,04, 0)

```java
package testproject;

import java.lang.Math;

public class oppg5f {
    public static void main(String[] args) {
        newtonMethod(2,10);
    }
    public static double f(double x) {
        double y = 2*Math.pow(x, 3)+9*Math.pow(x, 2)-(24*x)+1;
        return y;

    }
    public static double fder(double x) {
        double y = 6*Math.pow(x, 2)+(18*x)-24;
        return y;

    }
    public static double fdoubleder(double x) {
        double y = 12*x+18;
        return y;

    }
    public static double newtonMethod(double start, int repeats) {
        int n = 0;
        while (n < repeats) {
            double x_nplus1 = start-(f(start)/fder(start));
            System.out.println((n+1) + ": " + x_nplus1);
            start = x_nplus1;
            n++;

        }
        System.out.println(start);
        return start;
    }
}
```

```
<terminated> oppg5f [Java Applicatio
1: 1.8611111111111112
2: 1.847910898209018
3: 1.8477929408977811
4: 1.8477929315019168
5: 1.8477929315019168
6: 1.8477929315019168
7: 1.8477929315019168
8: 1.8477929315019168
9: 1.8477929315019168
10: 1.8477929315019168
1.8477929315019168
```

(1.8478,0)



(-6.39, 0)

L = {(0,04, 0), (1.8478,0), (-6.39, 0)}

TODO: (Fjern før dokument innleveres)

- 1d – Usikker/Uferdig
- Oppg 4
    - 4a – må sjekkes
    - 4b – Må sjekkes
    - 4c – må sjekkes
- 5e - usikker