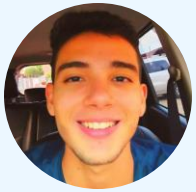
CÁLCULO NUMÉRICO

KALIMERA

Participantes:

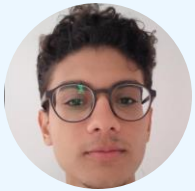
Felipe Duarte



João Fahning

Tiago Trindade

Nicholas Rodrigues



Thiago Leal

Fernando d’Ávila

Euro Da Cunha

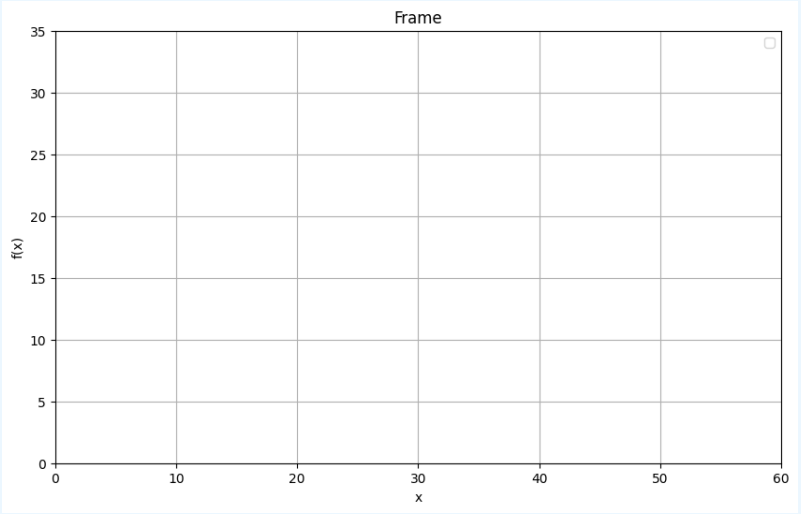
Renan Gondim

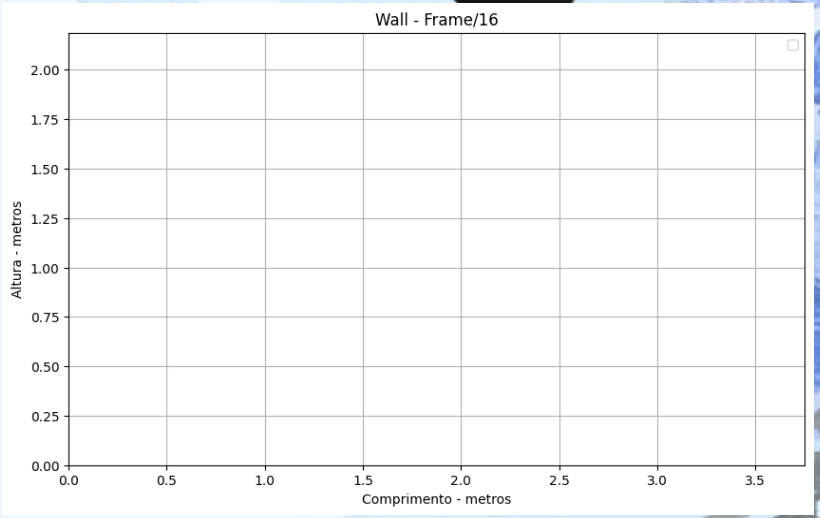
INTRODUÇÃO

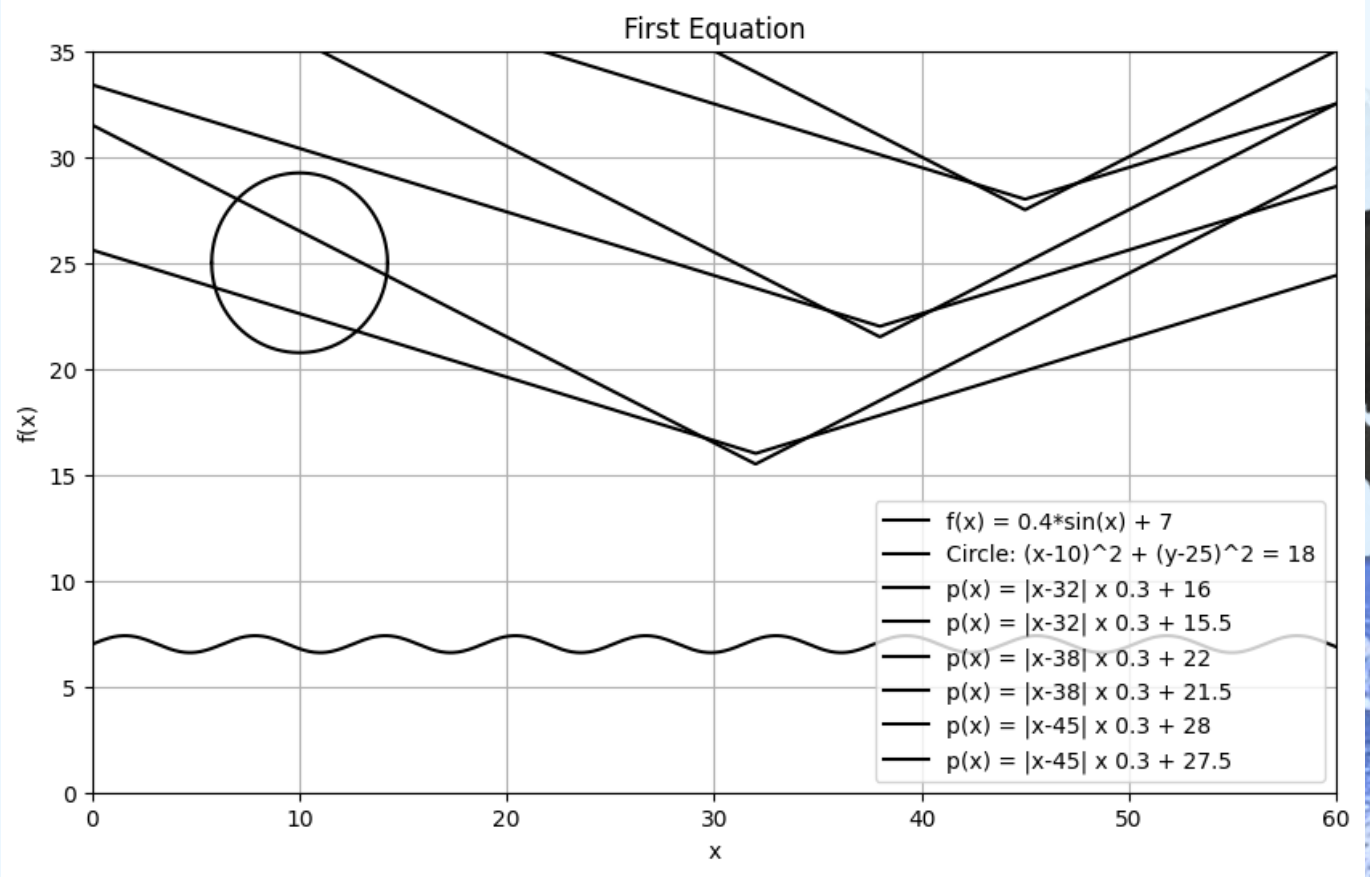
Contextualização

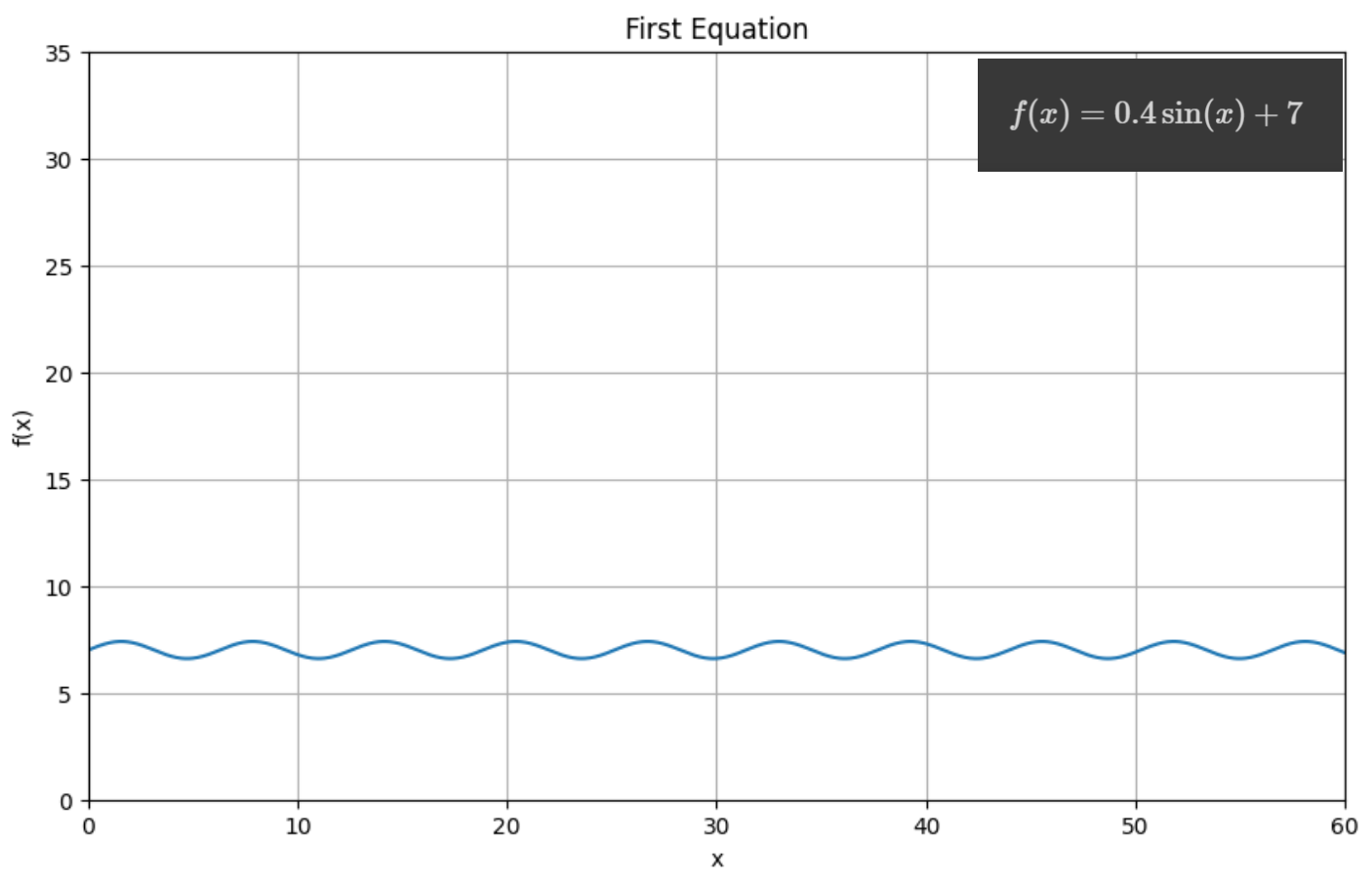
EQUAÇÕES

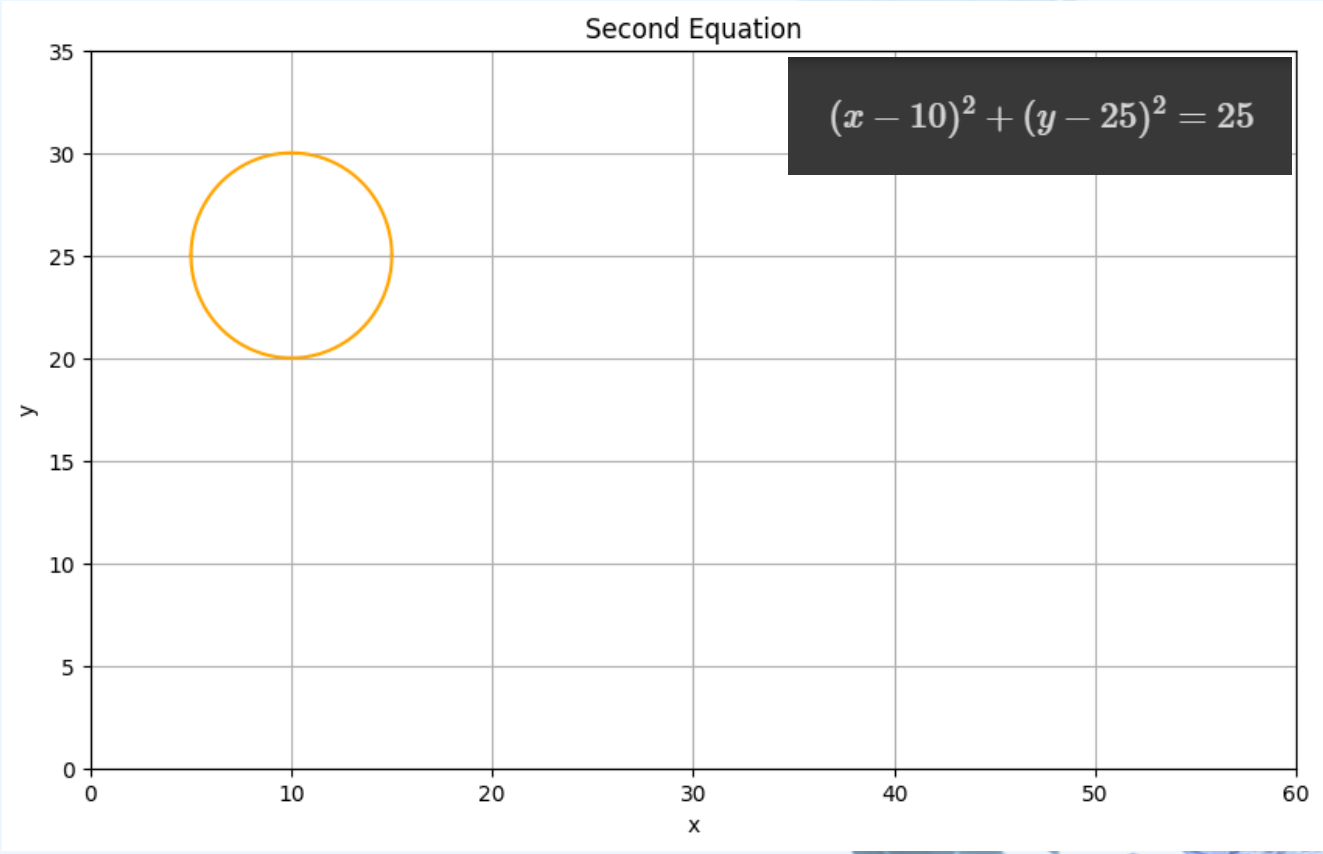
Plano x Parede

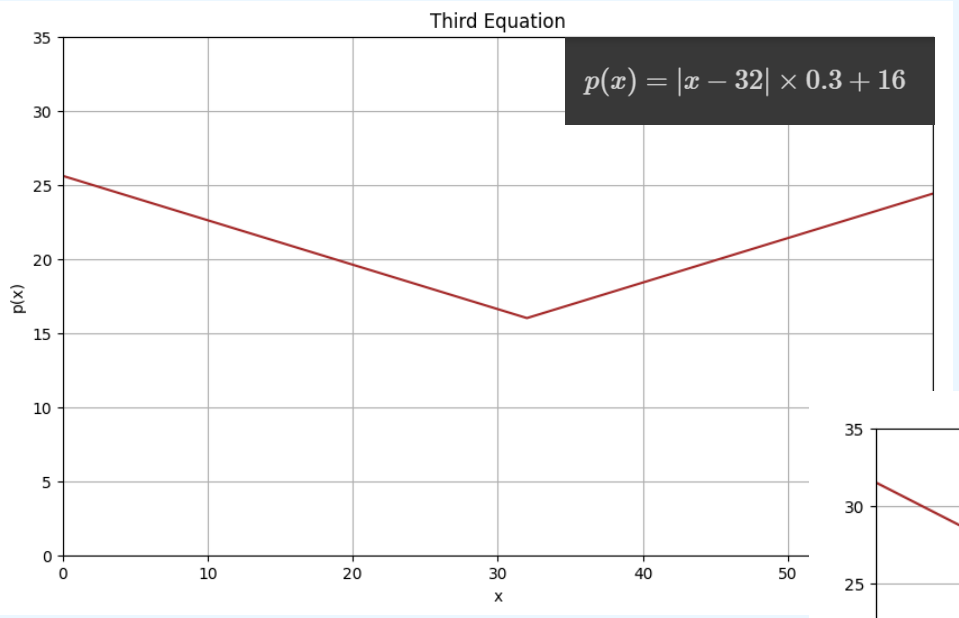


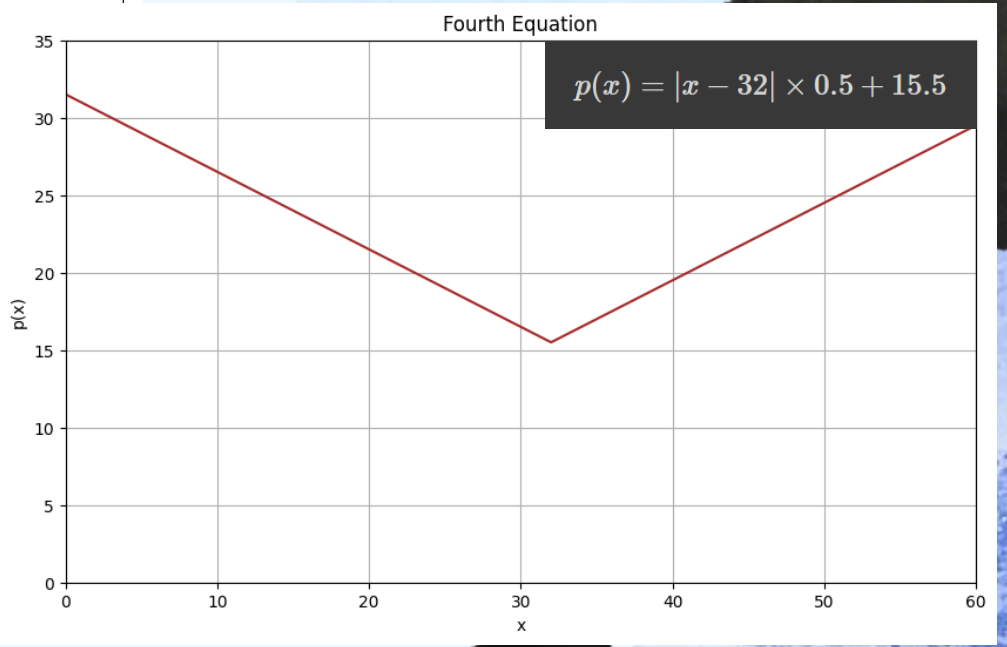


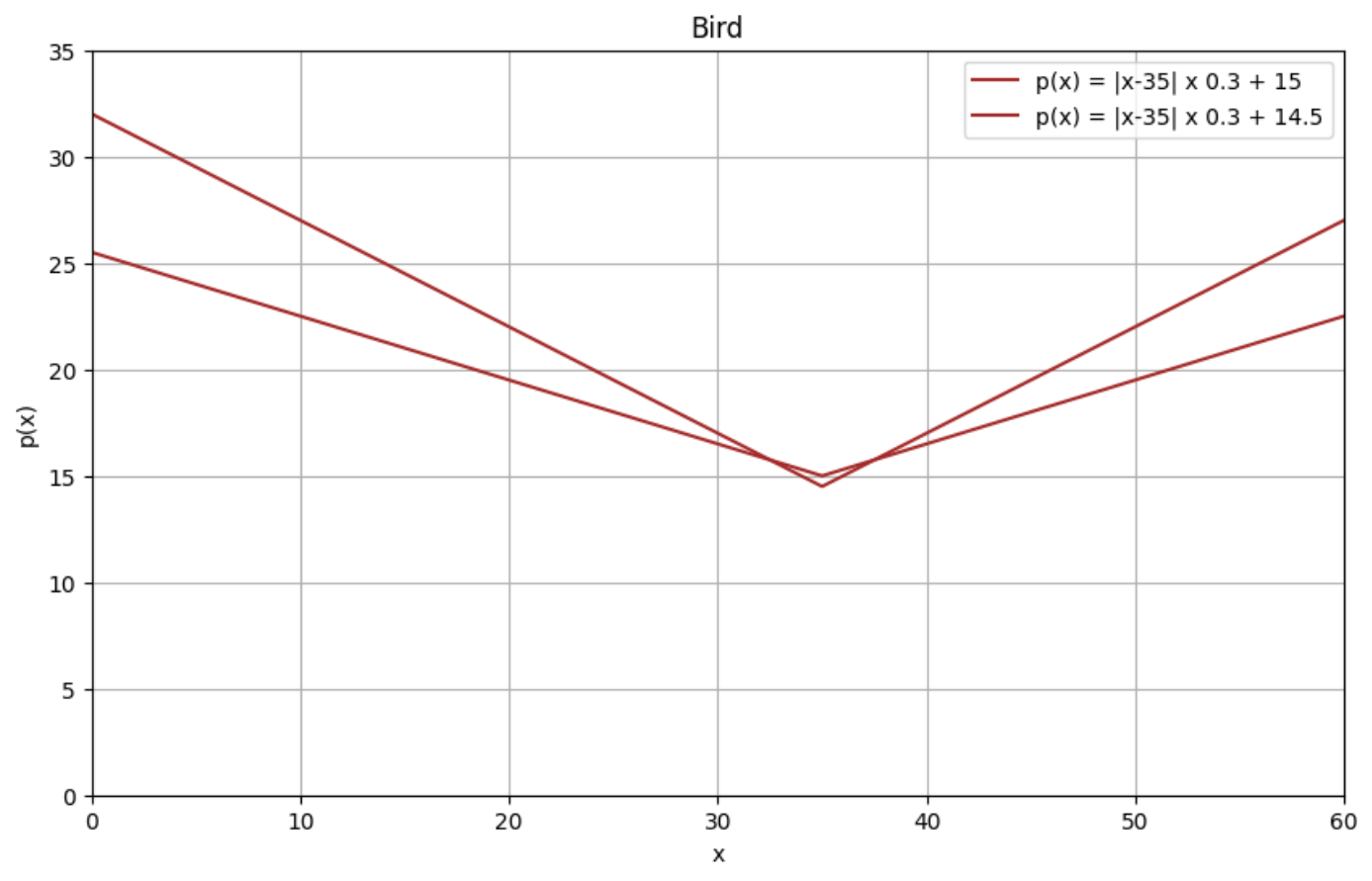

First Equation
f(x)
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60
f(x) = 0.4*sin(x) + 7
Circle: (x-10)^2 + (y-25)^2 = 18
p(x) = |x-32| x 0.3 + 16
p(x) = |x-32| x 0.3 + 15.5
p(x) = |x-38| x 0.3 + 22
p(x) = |x-38| x 0.3 + 21.5
p(x) = |x-45| x 0.3 + 28
p(x) = |x-45| x 0.3 + 27.5

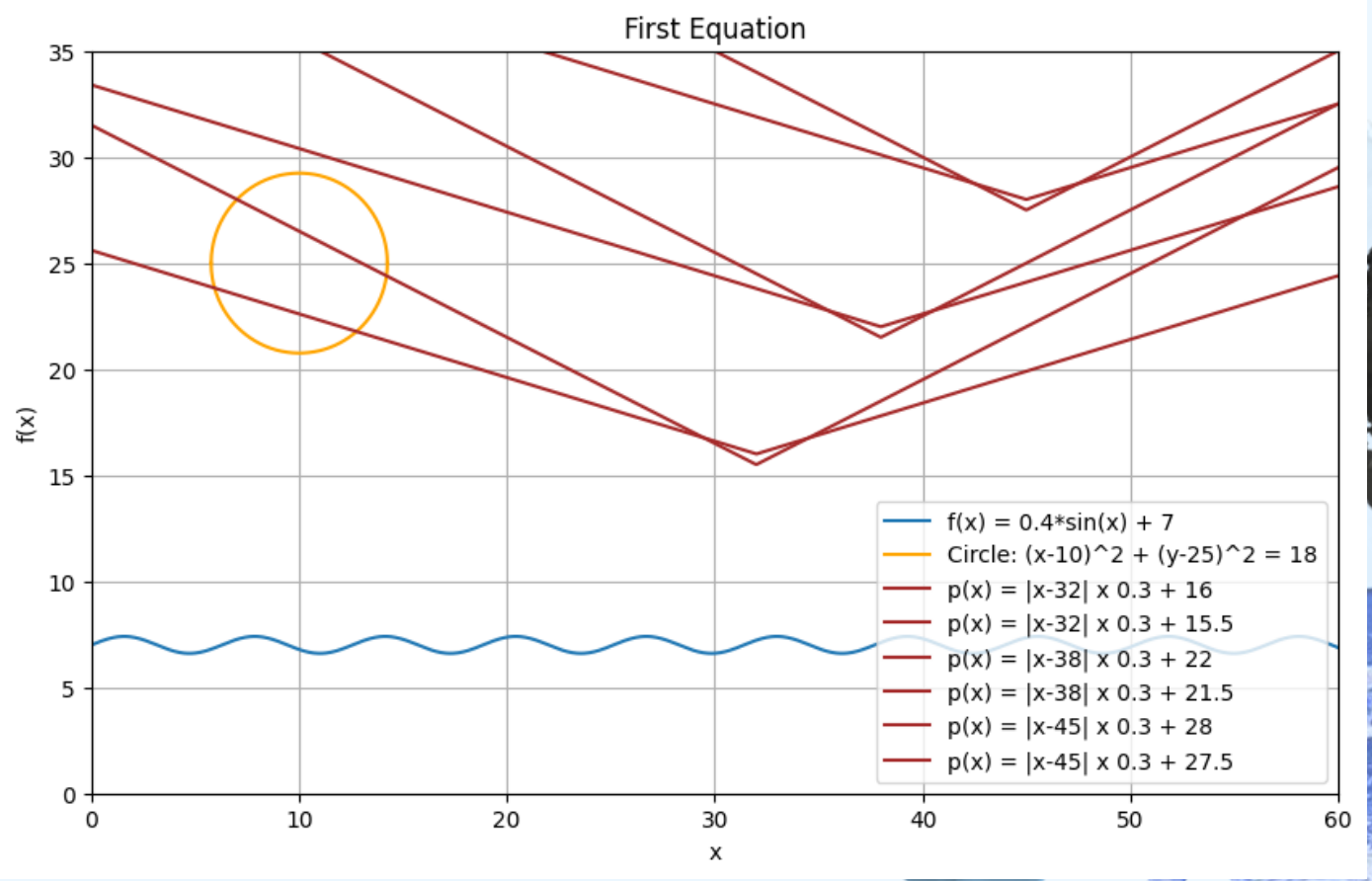

First Equation
$f(x) = 0.4\sin(x) + 7$
f(x)
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60


Second Equation
$(x-10)^2+(y-25)^2=25$
35
30
25
20
15
10
5
0
y
0
10
20
30
40
50
60
x


Third Equation
$p(x) = |x - 32| \times 0.3 + 16$
p(x)
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50


Fourth Equation
$p(x) = |x - 32| \times 0.5 + 15.5$
p(x)
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60


Bird
p(x) = |x-35| x 0.3 + 15
p(x) = |x-35| x 0.3 + 14.5
p(x)
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60


First Equation
f(x)
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60
f(x) = 0.4*sin(x) + 7
Circle: (x-10)^2 + (y-25)^2 = 18
p(x) = |x-32| x 0.3 + 16
p(x) = |x-32| x 0.3 + 15.5
p(x) = |x-38| x 0.3 + 22
p(x) = |x-38| x 0.3 + 21.5
p(x) = |x-45| x 0.3 + 28
p(x) = |x-45| x 0.3 + 27.5

INTEGRAÇÃO

Métodos

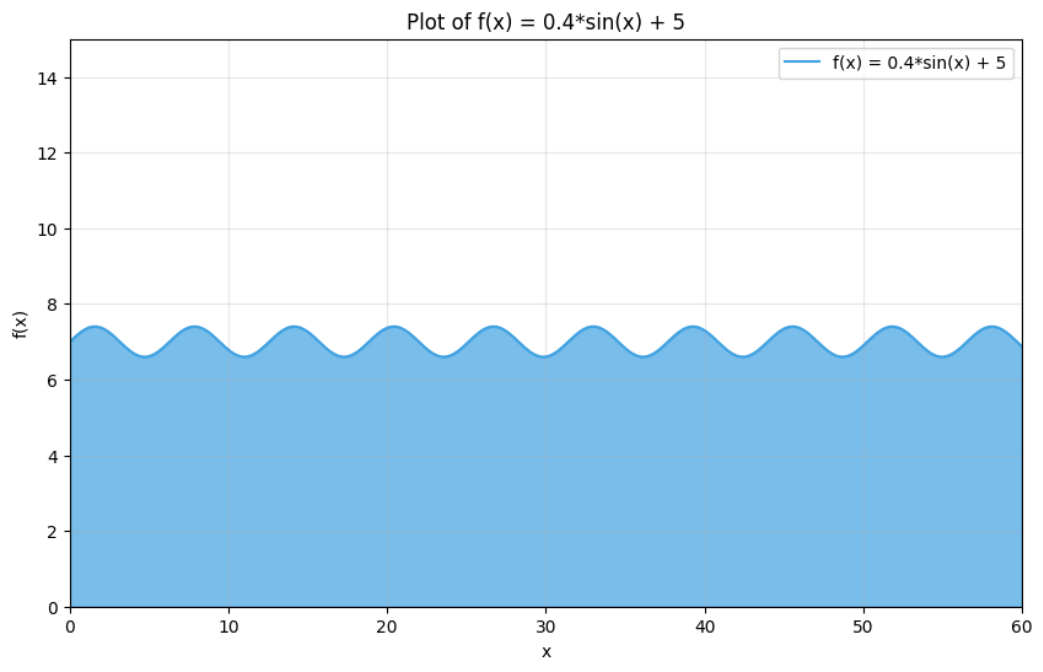
```
def integral_trapezio(h, Y):
    def integral_trapezio(h, Y):
        val = 0.0
        for i in range(1, len(Y) - 1):
            val += 2 * Y[i]
        val = 0.5 * h * (val + Y[0] + Y[-1])
        return val

    # Newton-Cotes: Regra 1/3 de Simpson
    def integral_onethird_simpson(h, Y):
        val = 0.0
        for i in range(1, len(Y) - 1, 2):
            val += 4 * Y[i]

        for i in range(2, len(Y) - 2, 2):
            val += 2 * Y[i]

        val = h / 3.0 * (val + Y[0] + Y[-1])
        return val
```

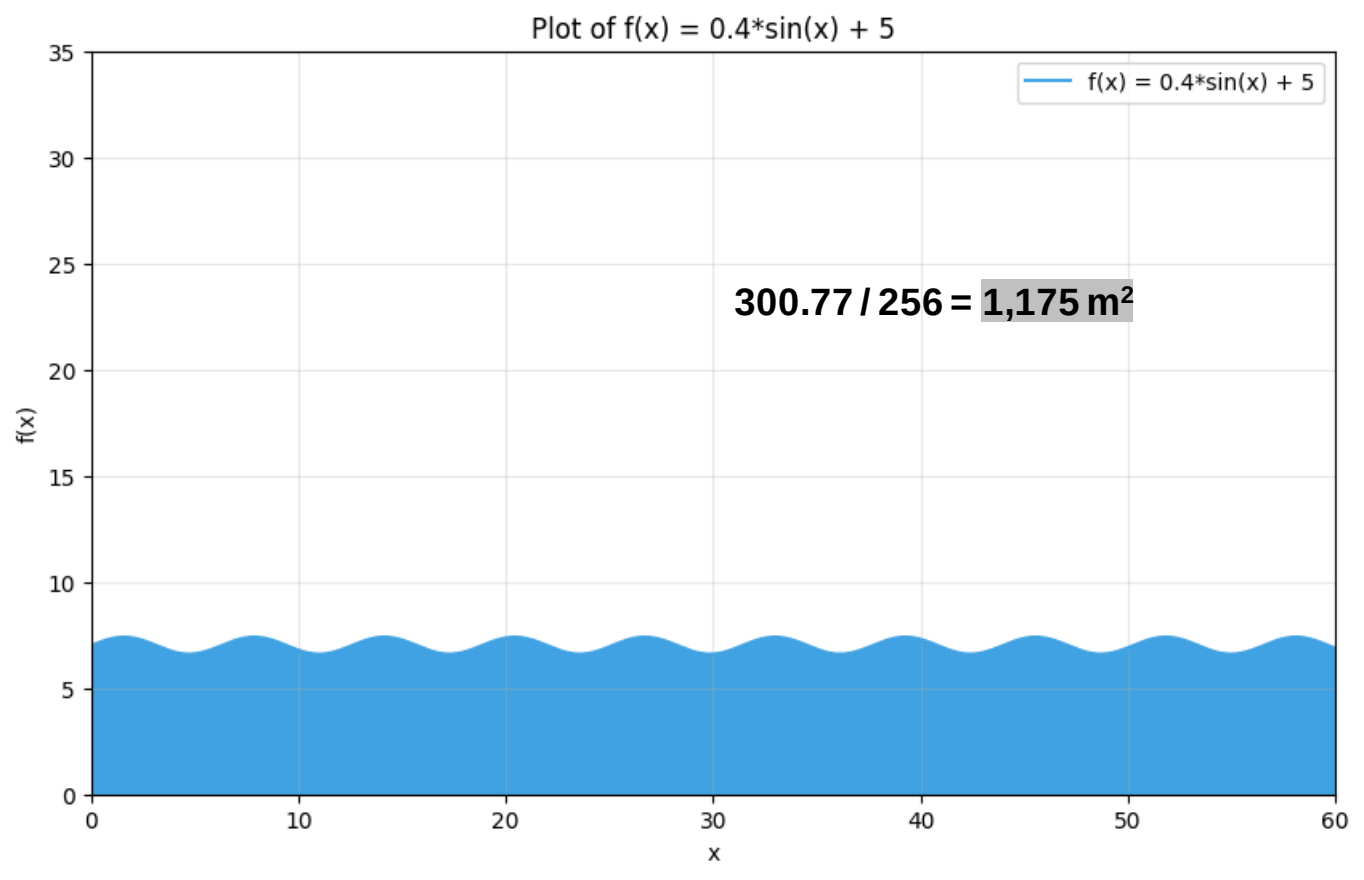
- Trapézio
- 1/3 Simpson

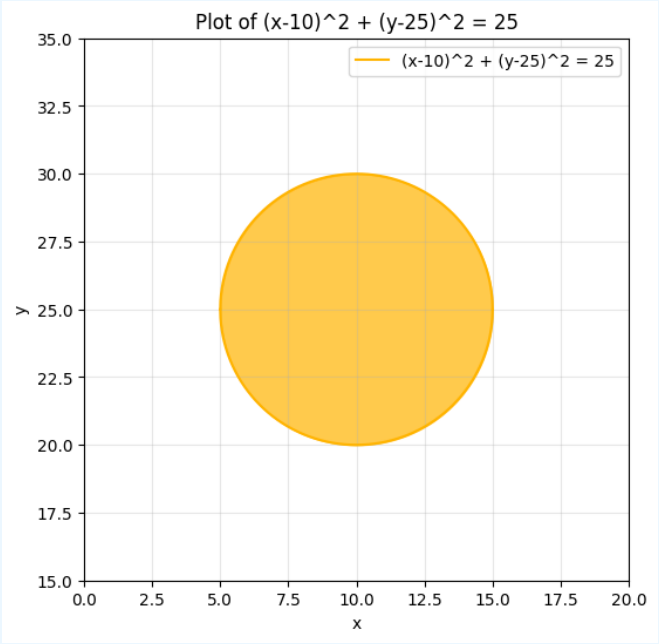


$$f(x) = 0.4\sin(x) + 5$$

$$\int_0^{60} (0.4\sin(x) + 5)\, dx$$

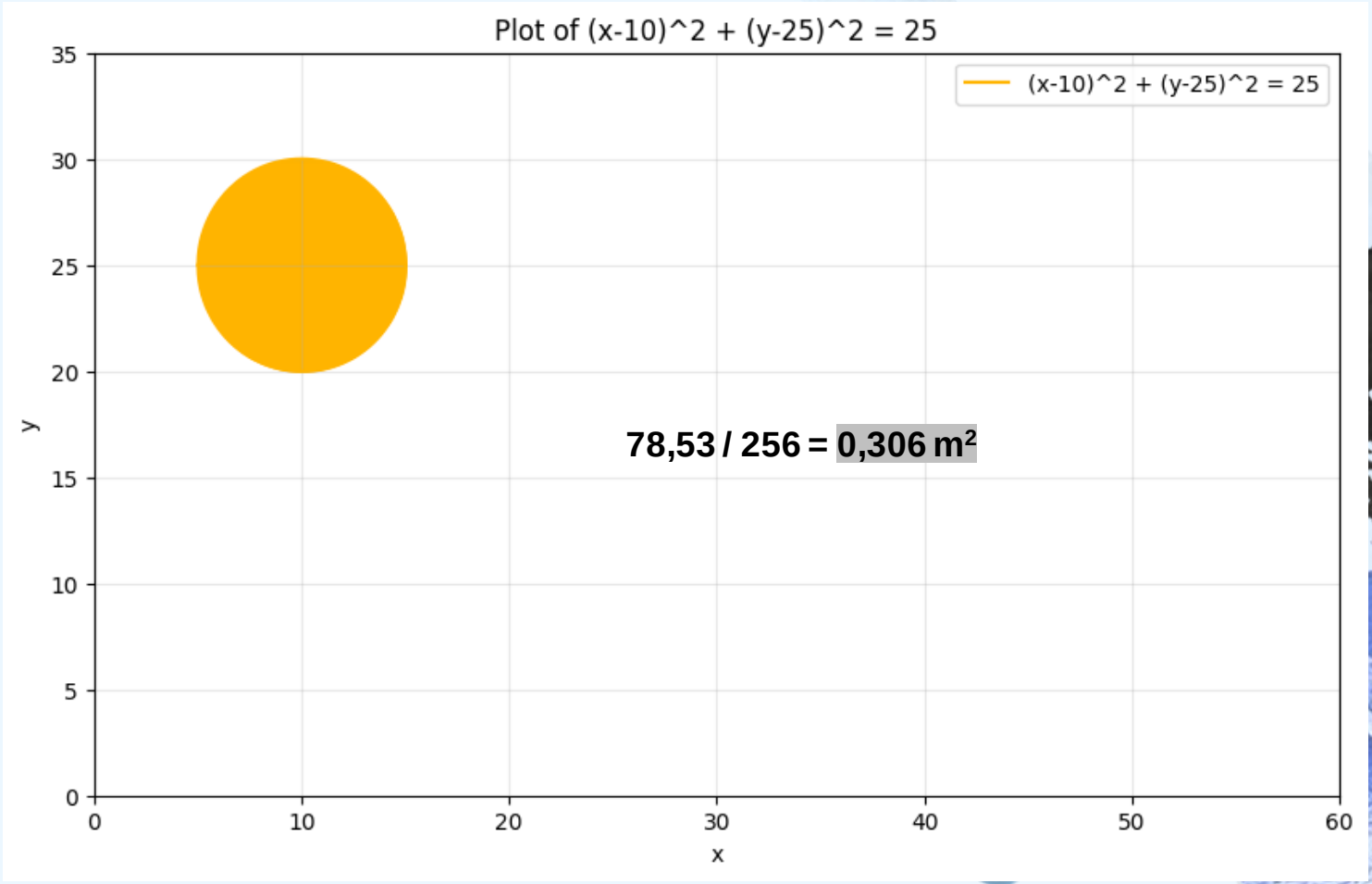
```
Integral exata (simbólica): 300.4 - 0.4*cos(60)
Integral exata (numérica): 300.78096519216604
*** Método de integração: TRAPEZIO ***
No. de pontos de integração = 11         I = 257.7854507538
No. de pontos de integração = 101        I = 297.7795984622
No. de pontos de integração = 1001       I = 300.4802506379
No. de pontos de integração = 10001      I = 300.7508877605
No. de pontos de integração = 100001     I = 300.7779573892
*** Método de integração: 13SIMPSON ***
No. de pontos de integração = 11         I = 257.6842472189
No. de pontos de integração = 101        I = 297.8035173576
No. de pontos de integração = 1001       I = 300.4804847637
No. de pontos de integração = 10001      I = 300.7508901032
No. de pontos de integração = 100001     I = 300.7779574126
```


Plot of f(x) = 0.4*sin(x) + 5
f(x) = 0.4*sin(x) + 5
300.77 / 256 = 1,175 m²
f(x)
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60



1. $(x-10)^2 + (y-25)^2 = 18$
2. $y = 25 \pm \sqrt{18 - (x-10)^2}$
3. $\text{Area} = \int_a^b \left(25 + \sqrt{18 - (x-10)^2}\right) dx - \int_a^b \left(25 - \sqrt{18 - (x-10)^2}\right) dx$

```
Integral exata (simbólica): 25*pi
Integral exata (numérica): 78.53981633974483
*** Método de integração: TRAPEZIO ***
No. de pontos de integração = 11          I = 69.0238370201
No. de pontos de integração = 101         I = 77.6799136411
No. de pontos de integração = 1001        I = 78.4587281969
No. de pontos de integração = 10001       I = 78.5318799978
No. de pontos de integração = 100001      I = 78.5390283199
*** Método de integração: 13SIMPSON ***
No. de pontos de integração = 11          I = 70.4584990921
No. de pontos de integração = 101         I = 77.7300143027
No. de pontos de integração = 1001        I = 78.4603290085
No. de pontos de integração = 10001       I = 78.5319306725
No. de pontos de integração = 100001      I = 78.5390299225
```

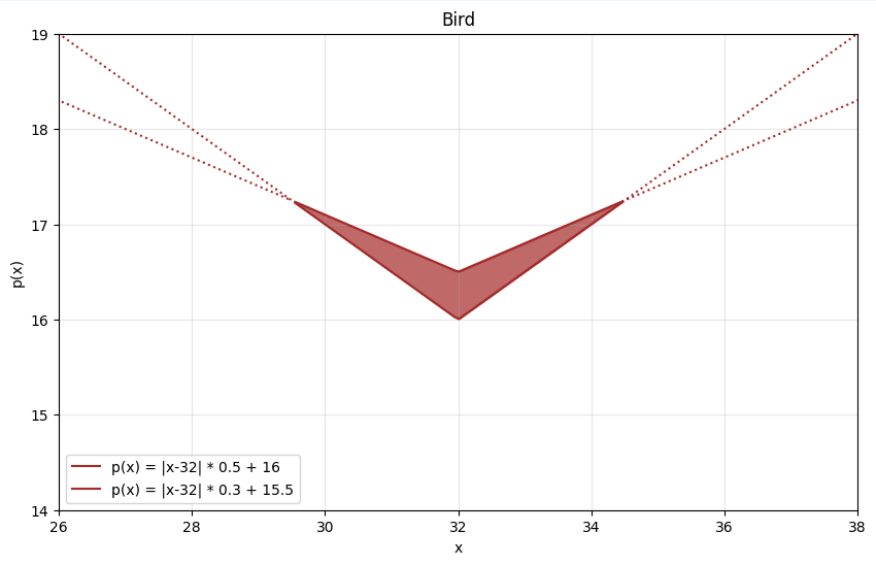

Plot of (x-10)^2 + (y-25)^2 = 25
(x-10)^2 + (y-25)^2 = 25
y
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60
78,53 / 256 = 0,306 m²

$$f(x) = 0.5|x - 32| + 15.5$$

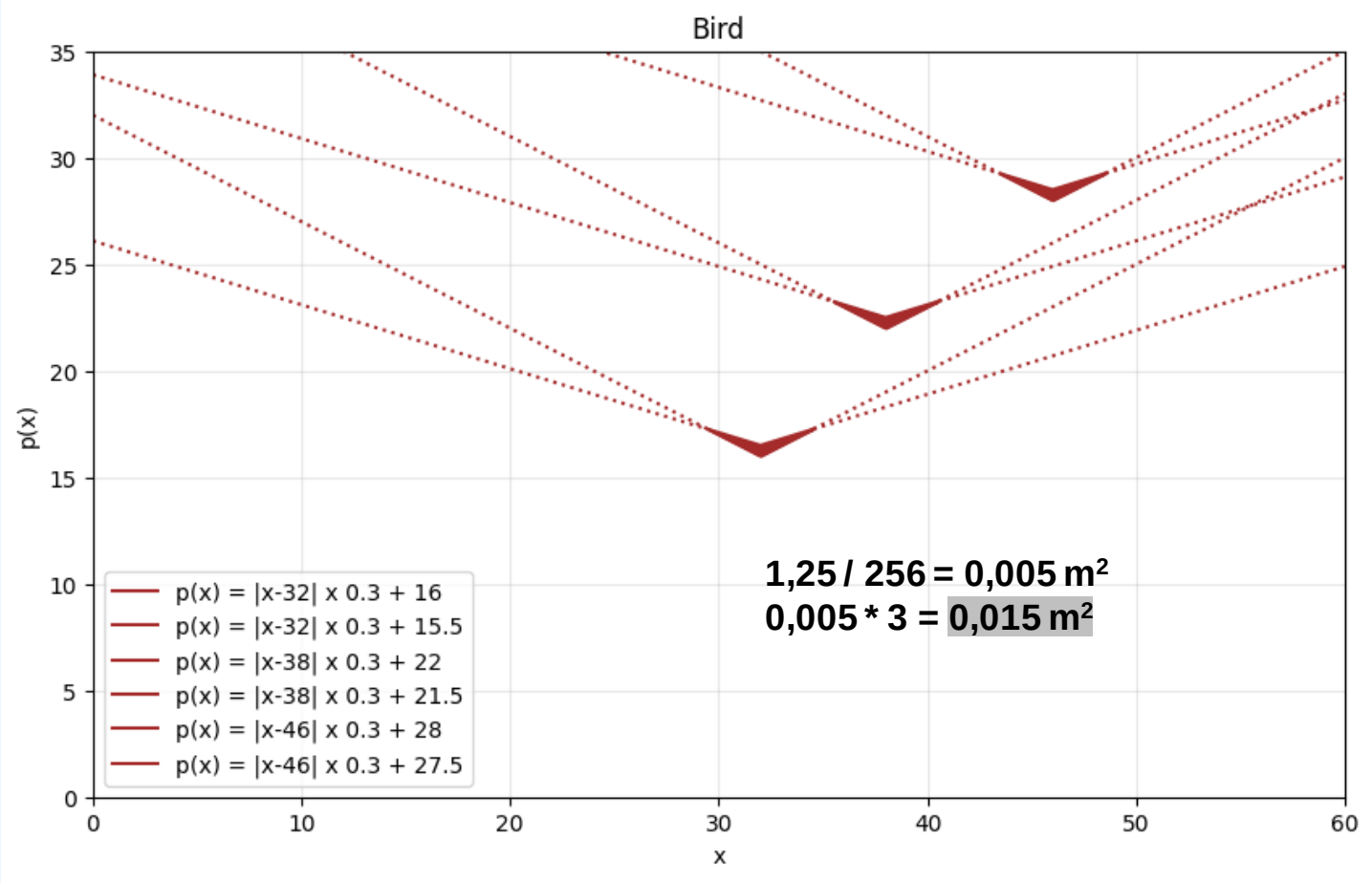
$$f(x) = 0.3|x - 32| + 16$$

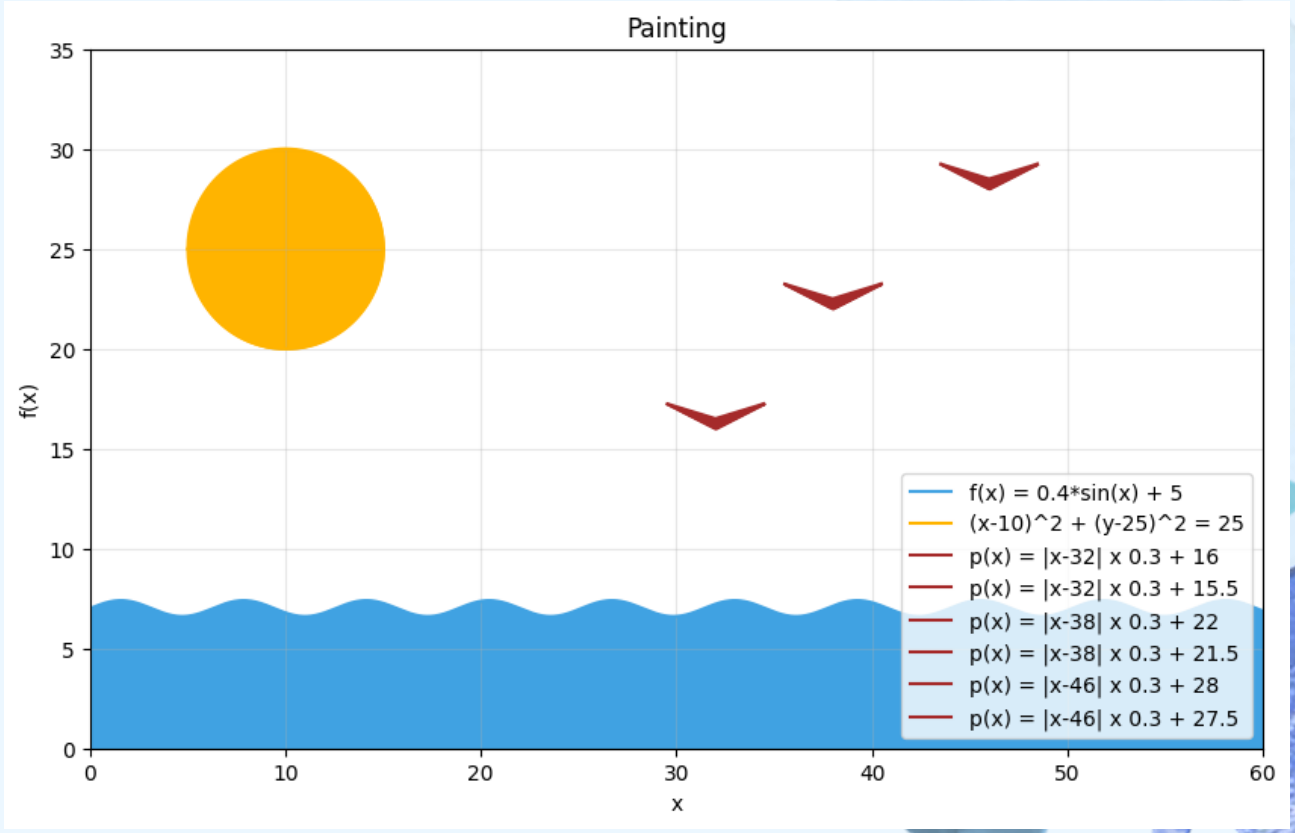
$$f(x) = 0.2|x - 32| - 0.5$$

$$\int_{29.5}^{34.5} f(x)\,dx = \int_{29.5}^{32} (0.2(32 - x) - 0.5)\,dx + \int_{32}^{34.5} (0.2(x - 32) - 0.5)\,dx$$




```
Integral exata (simbólica): -1.25000000000000
Integral exata (numérica): -1.25
*** Método de integração: TRAPEZIO ***
No. de pontos de integração = 11         I = -1.1363636364
No. de pontos de integração = 101        I = -1.2376237624
No. de pontos de integração = 1001       I = -1.2487512488
No. de pontos de integração = 10001      I = -1.2498750125
No. de pontos de integração = 100001     I = -1.2499875001
*** Método de integração: 13SIMPSON ***
No. de pontos de integração = 11         I = -1.1515151515
No. de pontos de integração = 101        I = -1.2376237624
No. de pontos de integração = 1001       I = -1.2487512488
No. de pontos de integração = 10001      I = -1.2498750125
No. de pontos de integração = 100001     I = -1.2499875001
```

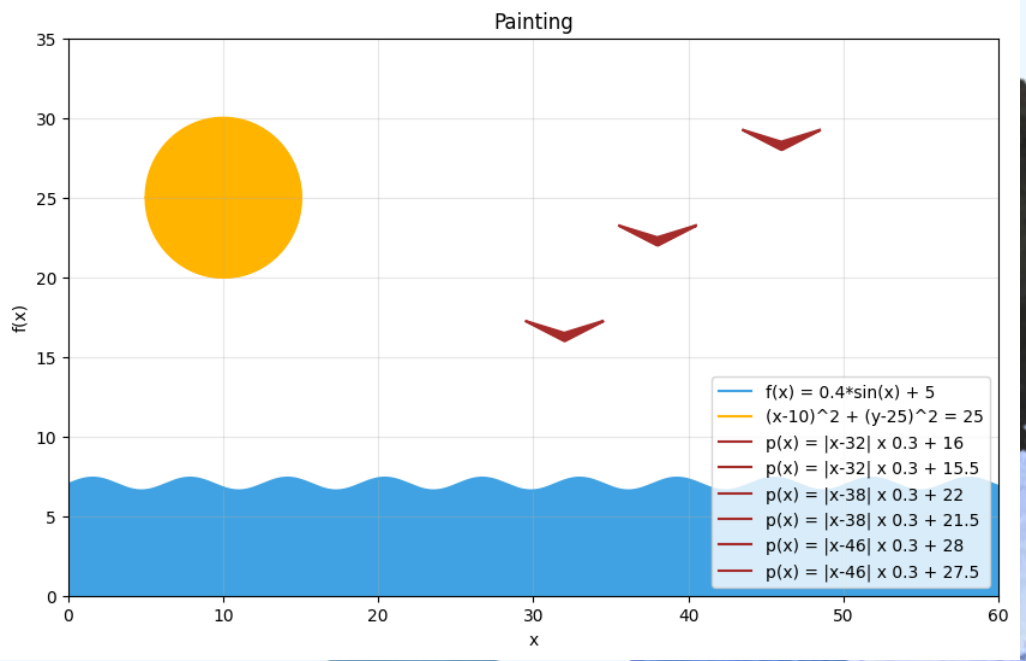

Bird
p(x)
x
p(x) = |x-32| x 0.3 + 16
p(x) = |x-32| x 0.3 + 15.5
p(x) = |x-38| x 0.3 + 22
p(x) = |x-38| x 0.3 + 21.5
p(x) = |x-46| x 0.3 + 28
p(x) = |x-46| x 0.3 + 27.5
1,25 / 256 = 0,005 m²
0,005 * 3 = 0,015 m²

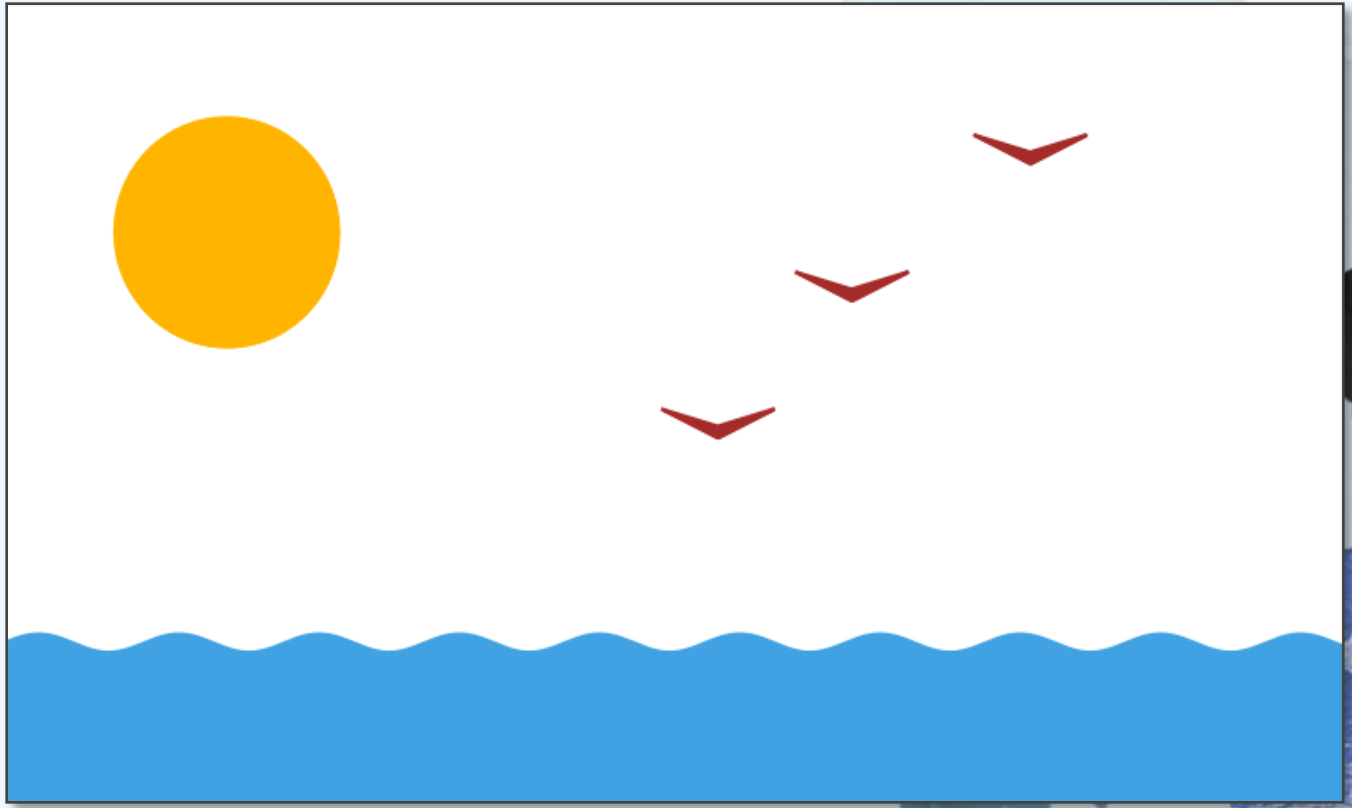

Painting
f(x)
x
0
5
10
15
20
25
30
35
0
10
20
30
40
50
60
f(x) = 0.4*sin(x) + 5
(x-10)^2 + (y-25)^2 = 25
p(x) = |x-32| x 0.3 + 16
p(x) = |x-32| x 0.3 + 15.5
p(x) = |x-38| x 0.3 + 22
p(x) = |x-38| x 0.3 + 21.5
p(x) = |x-46| x 0.3 + 28
p(x) = |x-46| x 0.3 + 27.5

0,306 m² papel amarelo

1,175 m² papel azul

0,015 m² papel marrom





OBRIGADO PELA ATENÇÃO!