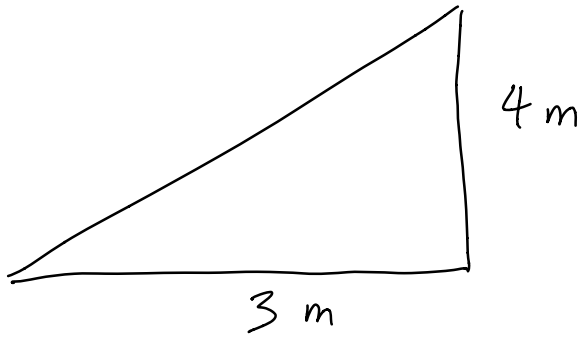
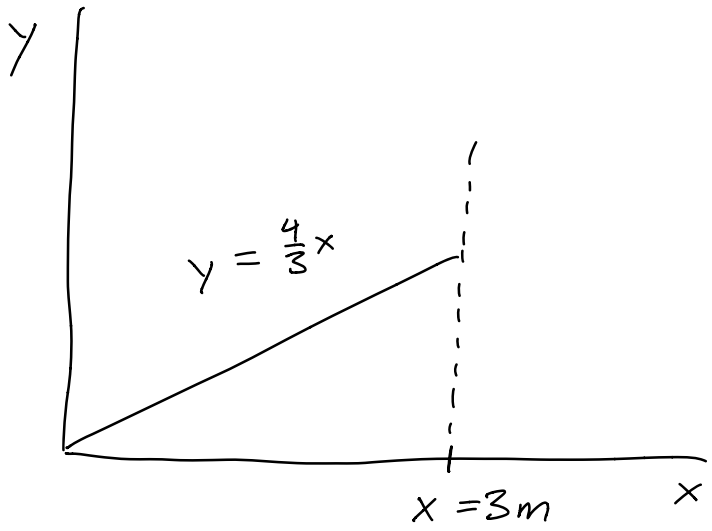
Area of a triangle

Ex 1



$$A = \frac{1}{2}(3m)(4m) = 6m^2$$

OR



$$A = \int_0^{3m} \frac{4}{3}x\,dx = \frac{2}{3}x^2\Big|_0^3 = \frac{2}{3}(9) = 6m^2$$

Reimann Sum

Want: $\int_{x_i}^{x_f} y(x)\,dx$

Break up into "n" many rectangles

of width $\Delta x = \frac{x_f - x_i}{n}$

$$A \cong h_1 \Delta x + h_2 \Delta x + h_3 \Delta x + \ldots + h_{n-1} \Delta x$$

$$\cong y(x_i)\Delta x + y(x_i + \Delta x)\Delta x + y(x_i + 2\Delta x)\Delta x + \ldots + y(x_i + (n-1)\Delta x)\Delta x$$

$$= \Delta x \sum_{k=0}^{n-1} y(x_i + k\Delta x)$$

```
#Initial example
def myfunc(x):
    return 2 * x

xi = 0
xf = 3
n = 10

dx = (xf - xi) / n
total = 0
for i in range(n):
    x = xi + i * dx
    y = myfunc(x)
    area = y * dx
    total += area
print(total)
```

```
#Read and plot
infile = open("data.txt","r")
lines = infile.readlines()
infile.close()
x = []
y = []
for line in lines:
    if line.startswith('#') or len(line)==0:
        continue
    xval,yval = line.split()
    x.append(float(xval))
    y.append(float(yval))

plt.plot(x,y)
```

```
#Integrate

total = 0
for i in range(len(x)-1):
    h = y[i]
    dx = x[i+1] - x[i]
    area = h * dx
    total += area
print(area)
```

```
def force(t):
    return 5000*(1-np.exp(-t**3/5-t**2))


def integrate(ti,tf,n):

    dt = (tf - ti) / n
    total = 0
    for i in range(n):
        t = ti + i * dt
        f = force(t)
        area = f * dt
        total += area
    return total


n = 10
ti = 0
tf = 8
mass = 1100
pf = integrate(ti,tf,n)
vf = pf / mass
print(vf)
```

Uncertainty