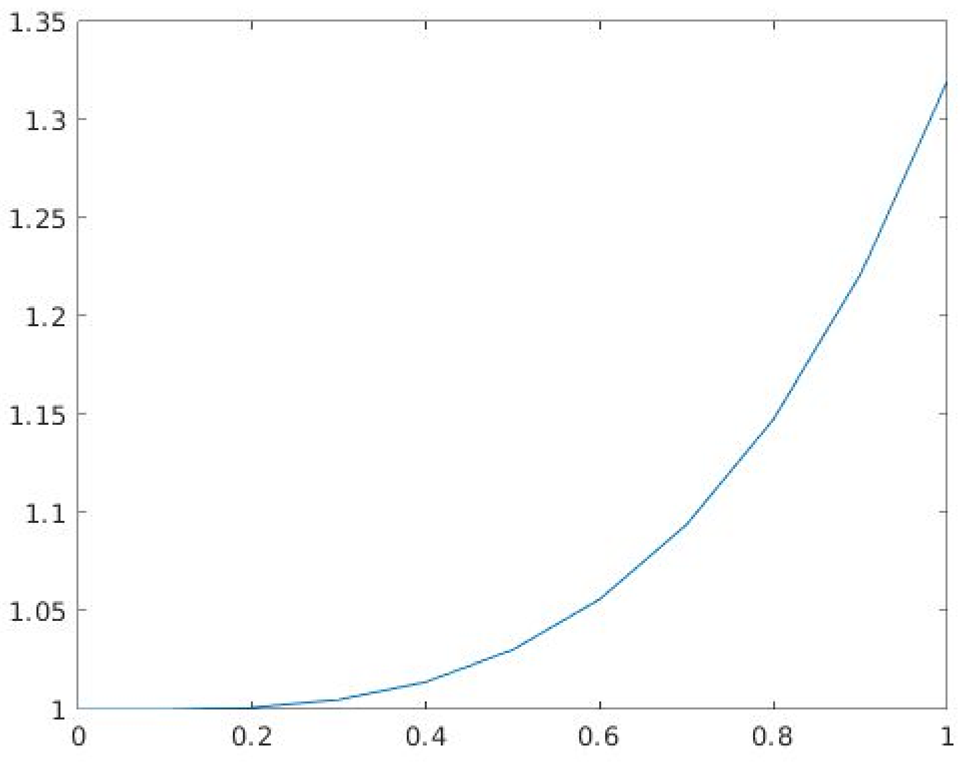
6.1 - CP1b

Resultat

Tabell

t	y	e
0	1	0
0.1	1	0.00033339
0.2	1.001	0.0016702
0.3	1.005	0.0040366
0.4	1.014	0.0075135
0.5	1.0303	0.012273
0.6	1.056	0.018625
0.7	1.094	0.027078
0.8	1.1477	0.038439
0.9	1.2211	0.053963
1	1.32	0.075597

Plot



Kildekode

CP1b.m

```
[t, y, e] = eulersmethod([0 1], 1, 10);
table(t', y', e', 'VariableNames', {'t', 'y', 'e'})
```

eulersmethod.m

```
% performs eulers method on function ydot
function [t, y, e] = eulersmethod(inter, y0, n)
    t(1) = inter(1);
    y(1) = y0;
    e(1) = 0;

    h = (inter(2) - inter(1)) / n;

    for  i = 1:n
        t(i+1) = t(i) + h;
        y(i+1) = eulerstep(t(i), y(i), h);
        e(i+1) = exact(t(i+1)) - y(i+1);
    end

    plot(t, y)
end
```

eulerstep.m

```
% one step in Eulers method
function y = eulerstep(t, y, h)
    y = y + h * ydot(t, y);
end
```

ydot.m

```
% right side of the ODE
function z = ydot(t, y)
    z = t^2 * y;
end
```

exact.m

```
% exact solution of ydot
function y = exact(t)
    y = exp((t^3)/3);
end
```

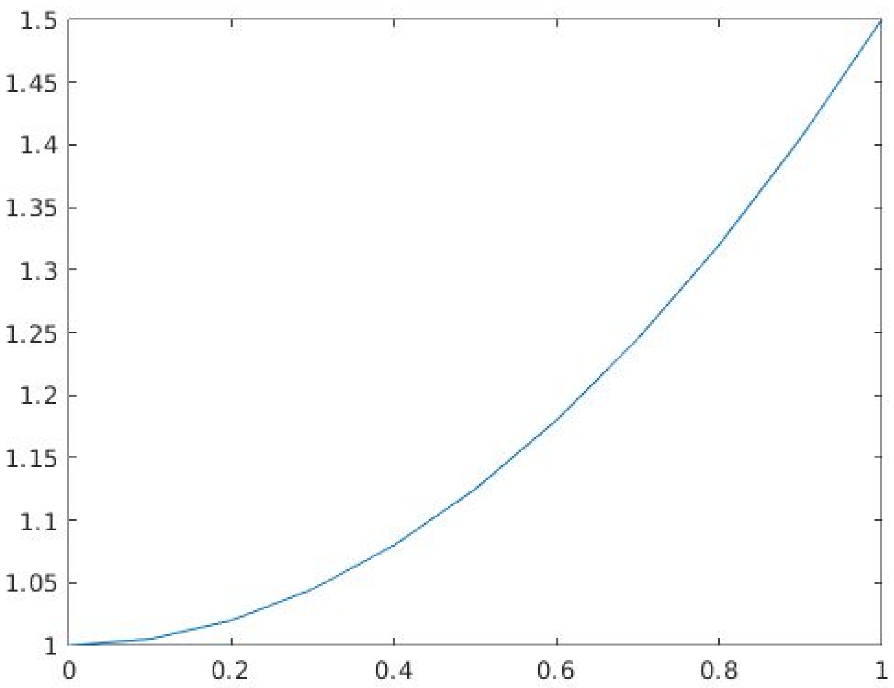
6.2 - CP1a

Resultat

Tabell

t	y	e
0	1	0
0.1	1.005	0
0.2	1.02	2.2204e-16
0.3	1.045	2.2204e-16
0.4	1.08	4.4409e-16
0.5	1.125	4.4409e-16
0.6	1.18	4.4409e-16
0.7	1.245	4.4409e-16
0.8	1.32	4.4409e-16
0.9	1.405	4.4409e-16
1	1.5	6.6613e-16

Plot



Kildekode

CP1a.m

```
[t, y, e] = trapezoidmethod([0 1], 1, 10);
table(t', y', e', 'VariableNames', {'t', 'y', 'e'})
```

trapezoidmethod.m

```
% performs the trapezoid method on function ydot
function [t, y, e] = trapezoidmethod(inter, y0, n)
    t(1) = inter(1);
    y(1) = y0;
    e(1) = 0;

    h = (inter(2) - inter(1)) / n;

    for  i = 1:n
        t(i+1) = t(i) + h;
        y(i+1) = trapezoidstep(t(i), y(i), h);
        e(i+1) = exact(t(i+1)) - y(i+1);
    end

    plot(t, y)
end
```

trapezoidstep.m

```
% one step in the trapezoid method
function y = trapezoidstep(t, y, h)
    y = y + (h/2) * (ydot(t, y) + ydot(t+h, y + h*ydot(t, y)));
end
```

ydot.m

```
% right side of the ODE
function z = ydot(t, y)
    z = t;
end
```

exact.m

```
% exact solution of ydot
function y = exact(t)
    y = 0.5 * t^2 + 1;
end
```