Série 3:

Exercice 1:

1/
```
function [a,b] = bracketing(x_min, x_max, f, n)
    a = x_min;
    delta = (x_max - x_min)/2;
    b = x_max;
    for i = 1 : n
        c = b;
        b = a + delta;
        if f(a) * f(b) > 0
            a = b;
            b = c;
        end
        delta = (b - a)/2;
    end
end
```

2/
```
function [x] = bissection(x_min, x_max, eps, f)
    n = floor(log((x_max - x_min)/eps));
    a = x_min;
    b = x_max;
    c = (a + b)/2;
    for i = 1 : n
        if ((f(a) * f(c)) < 0)
            b = c;
        else a = c;
        end
        c = (a + b)/2;
    end
end y = c;
```

Exercice 2 :

1/ $r_i = r_{i-1} - \dfrac{f(r_{i-1})}{f'(r_{i-1})}$

$= r_{i-1} - \dfrac{r_{i-1}^2 - x}{2 r_{i-1}}$

$= \dfrac{2 r_{i-1}^2 - r_{i-1}^2 - x}{2 r_{i-1}}$

$= \dfrac{r_{i-1}^2 - x}{2 r_{i-1}} = \dfrac{1}{2}\left(r_{i-1} - \dfrac{x}{r_{i-1}} \right)$

2/
```
function [r] = newton (x, n)
    r = x;
    for i = 1:n
        r = r - (r^2 - x)/(2*r);
    end
end
```

3/
```
function [r] = newton2(x0, delta)
    r = x0;
    r = r - (r^2 - x)/(2*r);
    erreur = abs(r - x0);
    % compt = 1;
    while erreur > delta
        x = ri;
        r = r - (r^2 - x)/(2*r);
        erreur = abs(r - x)
        % compt = compt + 1
    end
end
```

4°/ function [r, compt] = newton4 (x0, delta)

```
r = x0;
r = r - (r^2 - x0) / (2*r);
erreur = abs (r - x0);
compt = 1;
while erreur > delta && compt <= 10
    x = r;
    r = r - (r^2 - x0) / (2*r);
    erreur = abs (r - x);
    compt = compt + 1;
end
end
```

Exercice 3 :

```
function [r3] = secante (x0, x1, n)
r1 = x1;
r2 = (x0*x1 + x0) / (x1 + x0);
r3 = (r2*r1 + x0) / (r1 + r1);
for i = 1 : n - 3
    r1 = r2;
    r2 = r3;
    r3 = (r2*r1 + x0) / (r2 + r1);
end
end
```

Exercice 4 :

1°/ f = @(x) cos(2*x) + sin(2*x) + x - 1;

3% $f(x) = 0$

$\cos(2x) + \sin(2x) + x - 1 = 0$

$1 - (\cos(2x) + \sin(2x)) = x$

$\Rightarrow g(x) = 1 - (\cos(2x) + \sin(2x))$

4%

```
g = @(x) 1 - (cos(2*x) + sin(2*x));
```

5%

```
fplot(@(x) f(x), [-1 6])
fplot(@(x) g(x), [-1 6])
```

Dans le même graphe :

```
x = linspace(-1, 6, 100);
plot(x, f(x), x, g(x))
```

Exercice 5 :

1%

```
g = @(x) -4 + 4*x - (1/2)*(x^2)
```

2% $g(2) = 2$, $g(4) = 4$ $\Rightarrow$ point fixe

3% $g(x) = 0 \Leftrightarrow -4 + 5x - \frac{1}{2}x^2 = x$

```
f = @(x) -4 + 5*x - (1/2)*(x^2)
x0 = 1,2;
m = 2;
x = x0;
res1 = zeros(1,3);
err1 = zeros(1,3);
```

```
for  i = 0 : m
    y = x;
    x = f(y);
    err = abs(y - x)
    res1(i+1) = x;
    err1(i+1) = err;
end
```

4/

```
x0 = 3.8;
m = 2;
x = x0;
res2 = zeros(1,3)
err2 = zeros(1,3)
for i = 0 : m
    y = x;
    x = f(y);
    err = abs(y-x)
    res2(i+1) = x;
    err2(i+1) = err;
end
```