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# Prof. Dr. Serkan Dağ
# ME 310 Numerical Methods
# File 4.1
# Fixed-Point Iteration
# Solves nonlinear equations of the form x = g(x)
restart :
Digits := 16 :
# Define the equation
g := sin(sqrt(x));
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$$g := \sin\left(\sqrt{x}\right) \tag{1}$$

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# Number of significant figures and error criterion
n := 3 :
epss := 0.5*10^(2-n);
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$$epss := 0.05000000000000000 \tag{2}$$

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# Maximum number of iterations
kmax := 20 :
# Initial guess
xr0 := 3*Pi/16 :
# Unleash the iterations
for k from 1 by 1 to kmax
while true do
if k = 1 then
printf("\n %5.1f %15.10f", k - 1, xr0);
 end if:
 xrn := evalf( subs(x = xr0, g) ) :
 if xrn <> 0 then
 epsa := evalf( abs( (xrn - xr0)/xrn ) * 100 ) :
 end if:
 printf("\n %5.1f %15.10f %15.10f", k, xrn, epsa);
 xr0 := xrn :
 if epsa < epss then
 break:
 end if:
 end do:
```

```
 0.0    0.5890486225
 1.0    0.6943347124   15.1635930044
 2.0    0.7401325788    6.1877922467
 3.0    0.7580445102    2.3629128882
 4.0    0.7647527556    0.8771783197
 5.0    0.7672238267    0.3220795621
 6.0    0.7681285012    0.1177764597
 7.0    0.7684589617    0.0430030006
```