

```

function dxdt=harvest(t,x)
dxdt=zeros(1,1);
r=1;
k=10;
h=9/10;
dxdt(1)=r*x(1)*(1-x(1)/k)-h;
end

```

%Population Growth with Harvesting

%Analytical Solution

```
syms r x(t) h k
```

```
f=diff(x,t,1)==r*x*(1-x/k)-h
```

```
f2=x(0)==2
```

```
dsolve(f,f2)
```

%Numerical Solution

```
[t x]=ode45(@harvest,[0 10],2);
```

```
plot(t,x);xlabel('Time');ylabel('Population');title('Population Growth with Harvesting')
```

$$f(t) = \text{diff}(x(t), t) == -h - r \cdot x(t) \cdot (x(t)/k - 1)$$

$$f2 = x(0) == 2$$

$$\text{ans} = \frac{2 \cdot \tan\left(\frac{\text{atan}\left(\frac{2 \cdot r - (k \cdot r)}{2}\right)}{(h \cdot k \cdot r - (k^2 \cdot r^2)/4)^{1/2}}\right)}{(h \cdot k \cdot r - (k^2 \cdot r^2)/4)^{1/2} - t/k} \cdot (h \cdot k \cdot r - (k^2 \cdot r^2)/4)^{1/2} \cdot (h \cdot k \cdot r - (k^2 \cdot r^2)/4)^{1/2} + k \cdot r / (2 \cdot r)$$