Constrained optimization - methods

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```
function [x,numit]=newtonbacktrackg1g2LEC(f,df,d2f,A,b,x0,g1,g2
  epsilon=10^(-3);
  x=x0;
  maxit=100;
  for numit=1:maxit
      matr=[d2f(x) A'; A zeros(size(A,1))];
      vect=[-df(x); zeros(size(A,1),1)];
      solvedvals=matr\vect;
      d=solvedvals(1:size(A,2));
      eta=d'*d2f(x)*d;
      if eta^2/2<epsilon
          break;
      end
      % Armijos rule with two inequalities
      beta=0.2; s=0.5; sigma=10^(-3);
      m=0;
      while (f(x)-f(x+beta^m*s*d) < -sigma *beta^m*s *(df(x))'*
         m=m+1;
      end
      alpha = beta^m*s;

      x=x+alpha*d;
  end
```

```
function xopt=IPBopt(f,g1,g2,df,dg1,dg2,d2f,d2g1,d2g2,A,b,x0)
  xopt=x0;
  mu=1;
  alpha=0.1;
  r=2;
  epsilon=10^(-3);
  numitouter=0;
  while (r*mu>epsilon)
    [xopt,numit]=newtonbacktrackg1g2LEC(...
      @(x)(f(x)-mu*log(-g1(x))-mu*log(-g2(x))),...
      @(x)(df(x) - mu*dg1(x)/g1(x) - mu*dg2(x)/g2(x)),...
      @(x)(d2f(x) + mu*dg1(x)*dg1(x)'/(g1(x)^2) ...
           + mu*dg2(x)*dg2(x)'/(g2(x)^2) - mu*d2g1(x)/g1(x)...
           - mu*d2g2(x)/g2(x) ),A,b,xopt,g1,g2);
    mu=alpha*mu;
    numitouter=numitouter+1;
    fprintf('Iteration %i:',numitouter);
    fprintf('(%f,%f)\n',xopt,f(xopt));
  end
```

Example 6.3

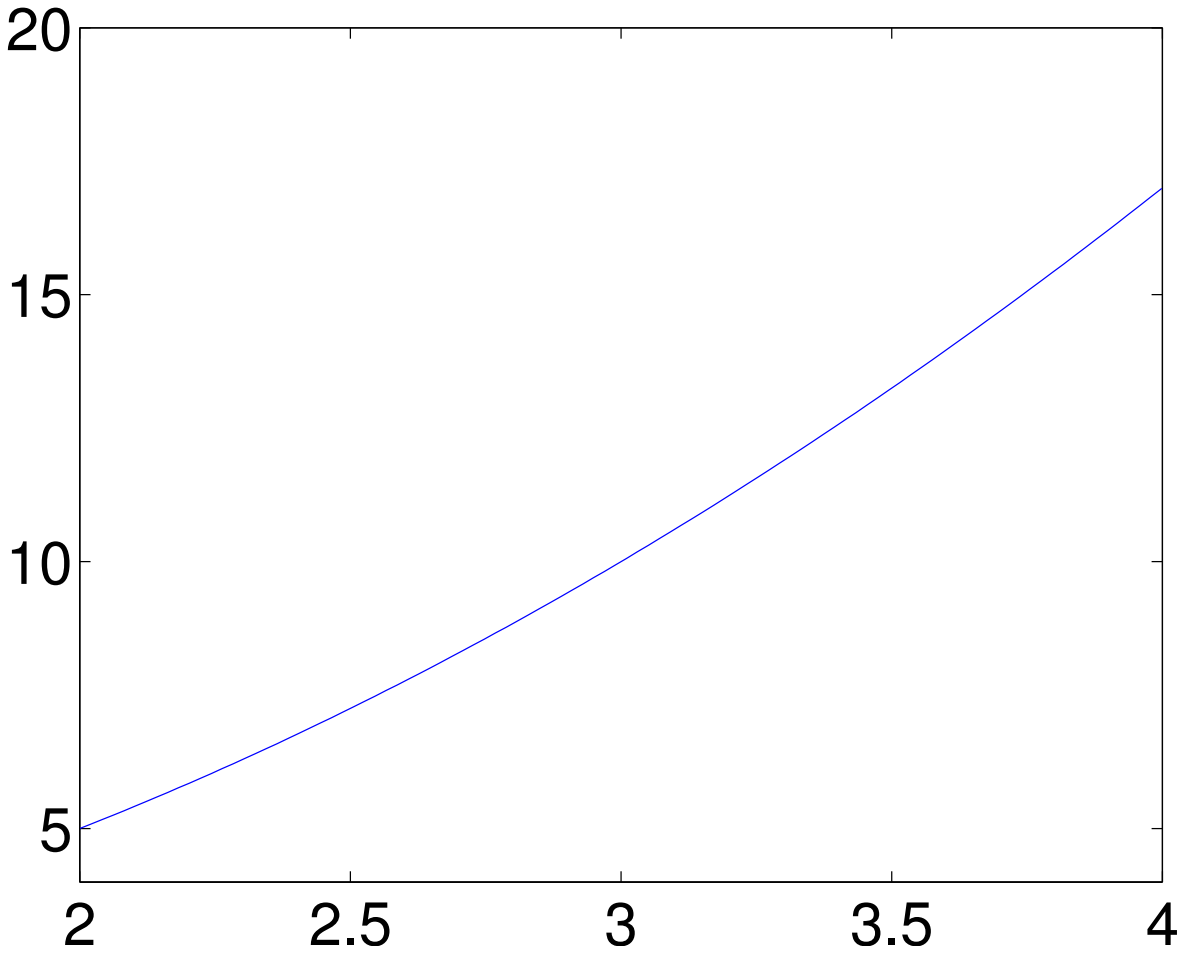

Figure: $f(x)$.

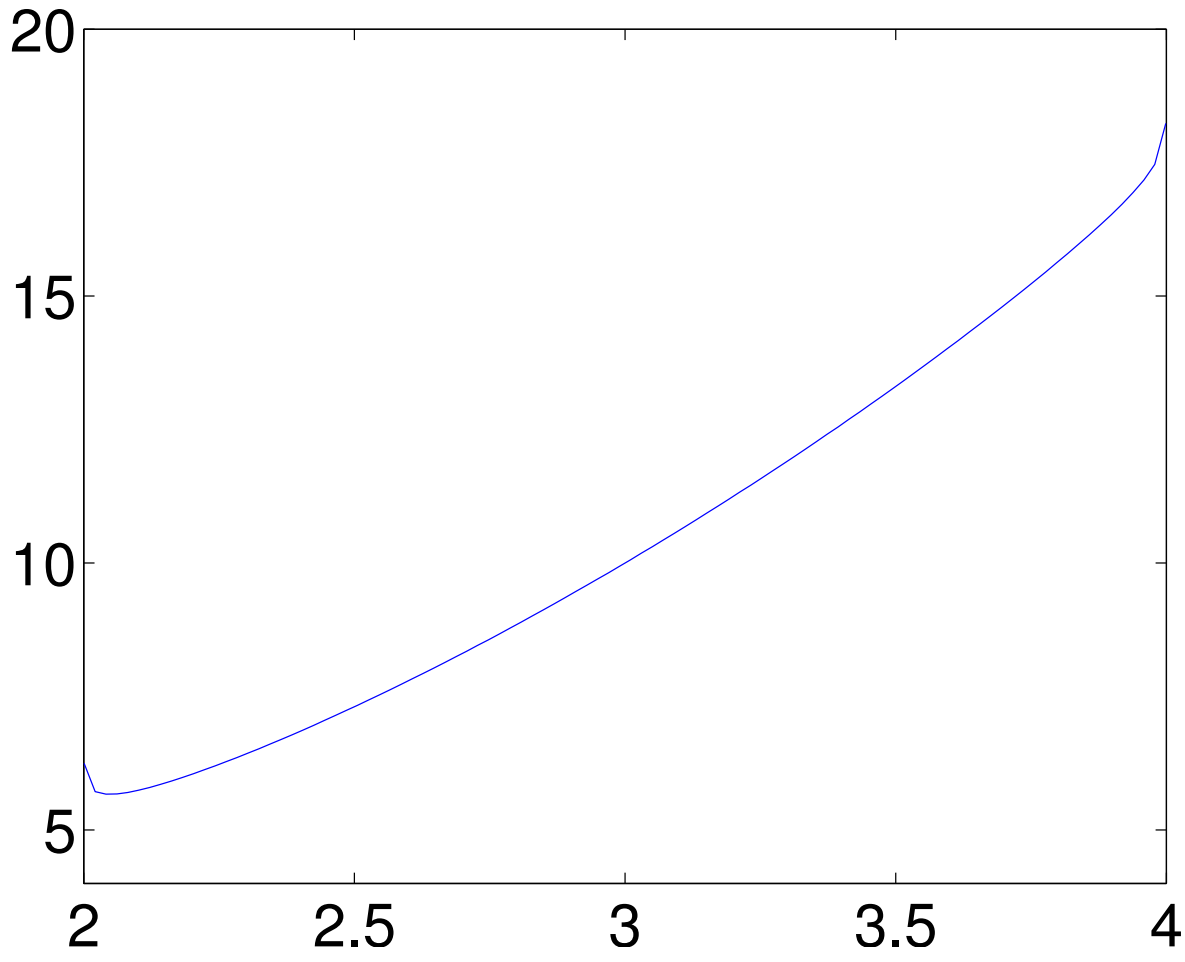

Figure: $\mu = 0.2$.

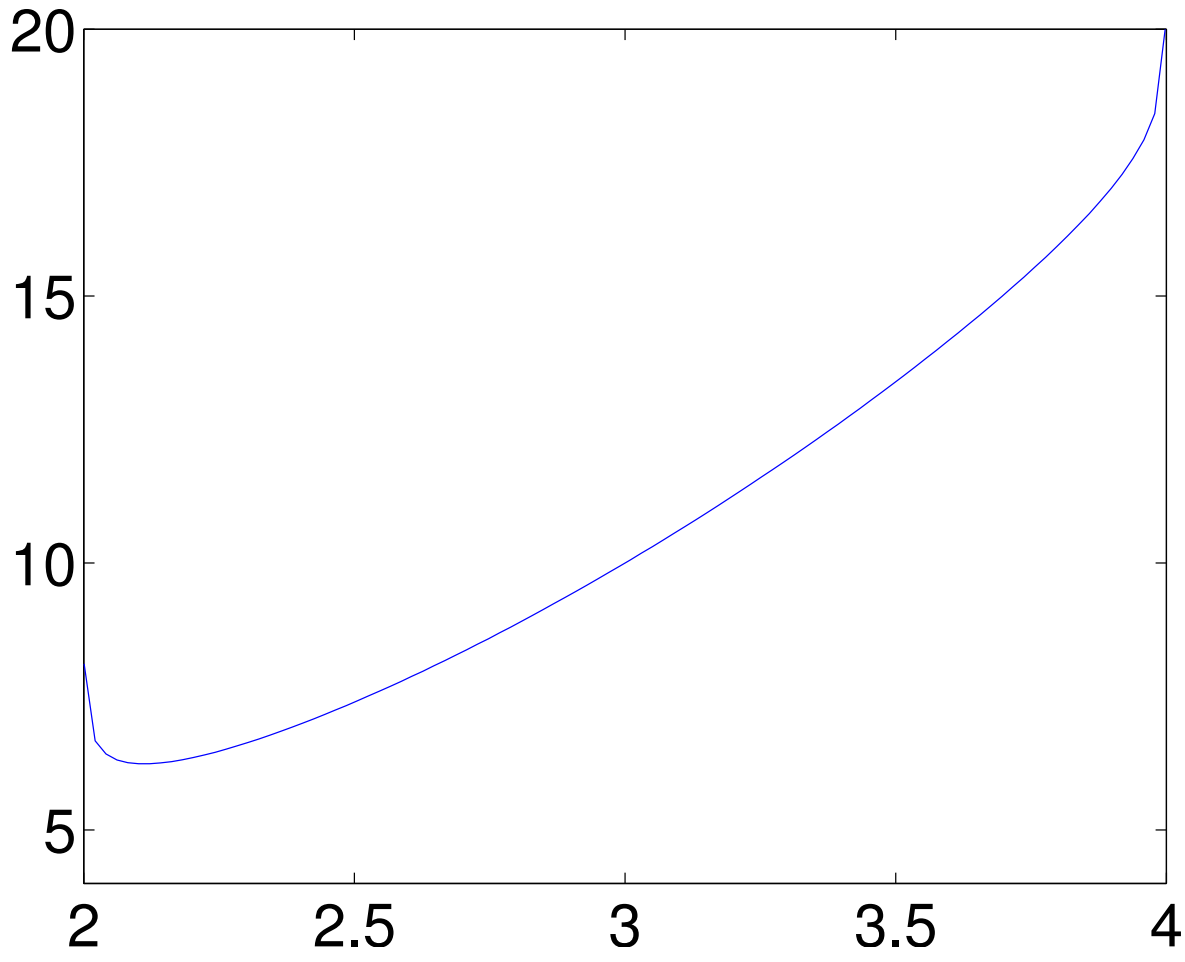

Figure: $\mu = 0.5$.

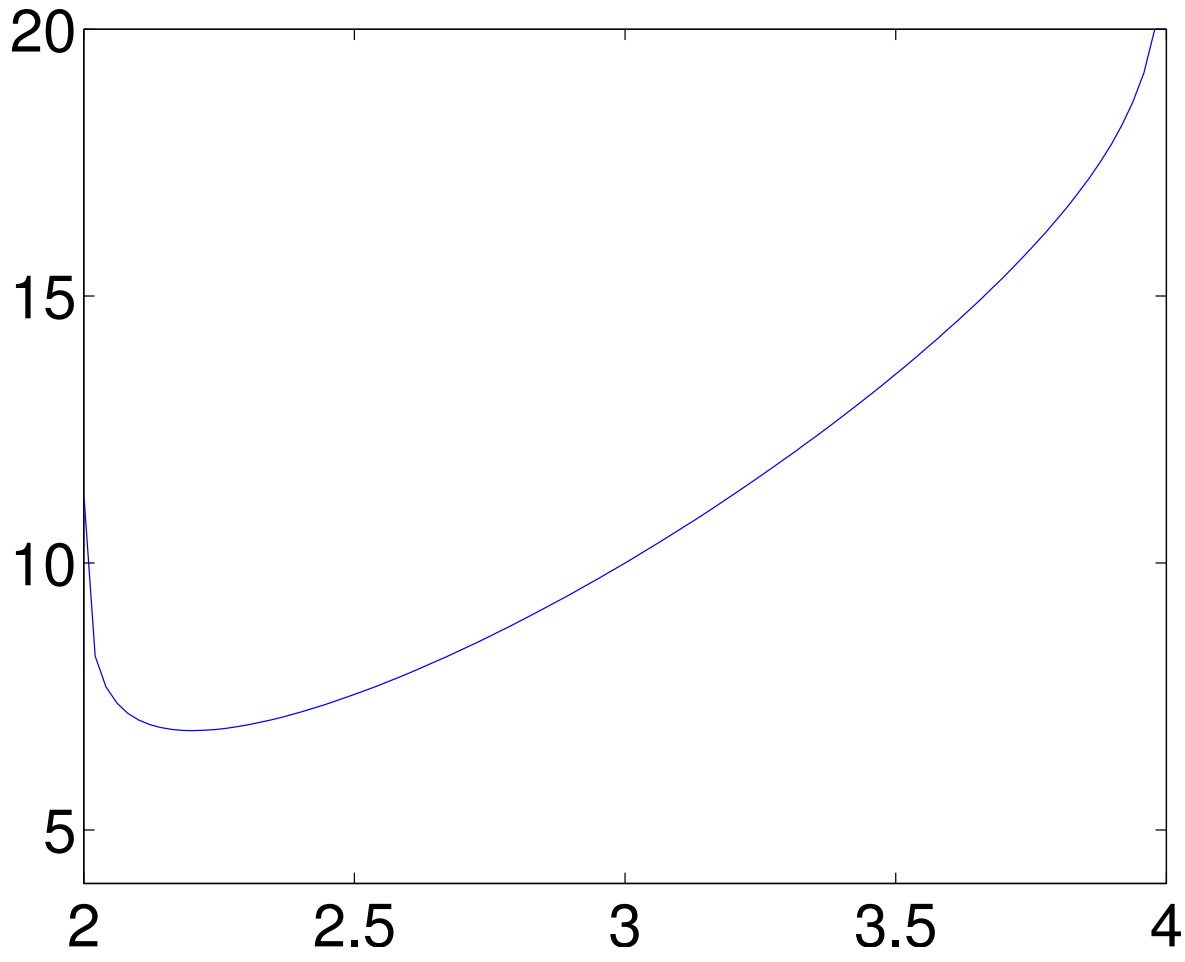

Figure: $\mu = 1$.

```
function xopt=IPBopt2(f,g1,g2,df,dg1,dg2,d2f,d2g1,d2g2,x0)
  xopt=x0;
  mu=1; alpha=0.1; r=2; epsilon=10^(-3);
  numitouter=0;
  while (r*mu>epsilon)
    [xopt,numit]=newtonbacktrackg1g2(...
      @(x)(f(x)-mu*log(-g1(x))-mu*log(-g2(x))),...
      @(x)(df(x) - mu*dg1(x)/g1(x) - mu*dg2(x)/g2(x)),...
      @(x)(d2f(x) + mu*dg1(x)*dg1(x)'/(g1(x)^2) ...
           + mu*dg2(x)*dg2(x)'/(g2(x)^2) ...
           - mu*d2g1(x)/g1(x) - mu*d2g2(x)/g2(x) ),xopt,g1,g2);
    mu=alpha*mu;
    numitouter=numitouter+1;
    fprintf('Iteration %i:',numitouter);
    fprintf('(%f,%f)\n',xopt,f(xopt));
  end
```

```
IPBopt2(@(x)(x.^2+1),@(x)(2-x),@(x)(x-4),...
        @(x)(2*x),@(x)(-1),@(x)(1),...
        @(x)(2),@(x)(0),@(x)(0),3)
```