

Composite Numerical Integration

A short review of 'sum', 'feval' for vectors. Please see for more details 'doc sum', 'doc feval'.

```
>> t=1:3:10
t=
     1     4     7    10
>> sum(t)
ans =
     22
>> f=@(x)x.^2+1
f=
     @(x)x.^2+1
>> p=feval(f,t)
p=
     2    17    50   101
>> r=sum(feval(f,t))
r=
    170
```

1. Composite Simpson's Rule:

(Algorithm 4.4, Theorem 4.4)

```
function integral = compsimp(a,b,n,f)
% Approximate the integral of f from a to b
% by using Composite Simpson's Rule
%Theorem 4.4, Algorithm 4.4
%check if n is even
if mod(n,2) ~= 0
    disp('n must be an even number!')
    return;
end
h = (b-a)/n;
xi0 = feval(f,a)+feval(f,b);
xi1 = 0;
xi2 = 0;
for i = 1:n-1
    x = a+i*h;
    %check if i is even or odd
    if mod(i,2) == 0
        % if i is even, find the sum of f(x2)+f(x4)+.....+f(xn-2)
        xi2 = xi2+feval(f,x);
    else
        %if i is odd, find the sum of f(x1)+f(x3)+.....f(xn-1)
        xi1 = xi1+feval(f,x);
    end
end
%approximate the integral, formula from Theorem 4.4, page 204
xi = h*(xi0+2*xi2+4*xi1)/3;
xi
```

Example 1.

```
>> f
```

```
f =
```

```
 @(x)x.^4
```

```
>> compsimp(0, 2, 6, f)
```

```
xi =
```

```
 6.403292181069958
```

```
>> g
```

```
g =
```

```
 @(x)sin(x)
```

```
>> compsimp(0, 2, 16, g)
```

```
xi =
```

```
 1.416148760897955
```