14-Sep-2020

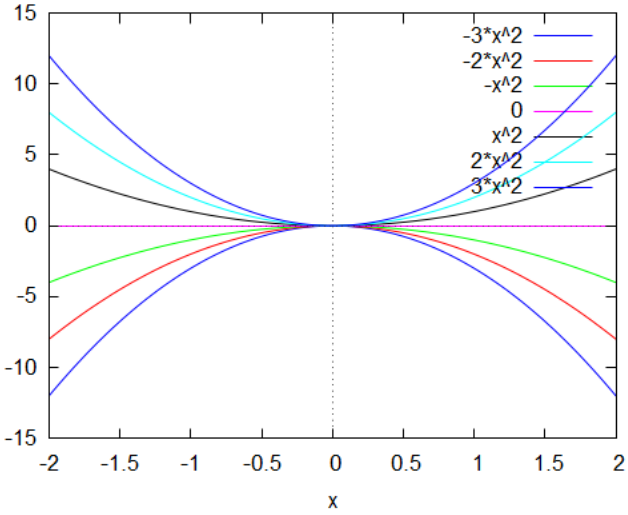
Q Plot the graph of y = c*x^2, and analyse the effects of c by taking different choices for c

```
--> f ( x , c ) : = c · x ^ 2 ;
```

(%o1) $f(x,c) := c\,x^2$

```
--> wxplot2d ( makelist ( f ( x , c ) , c , − 3 , 3 ) , [ x , − 2 , 2 ] ) ;
```

(%t2)



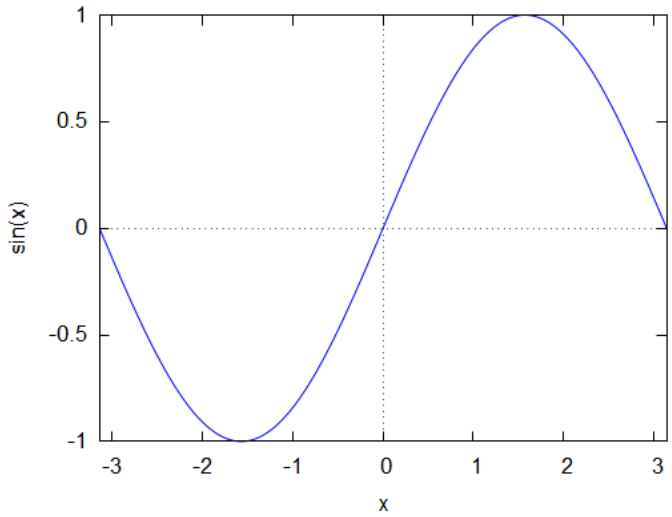
(%o2)

c is affecting the slope of c*x^2

Q plot the graph of
(i) Sin(x) in [-Π, Π]
(ii) Sin(2x + 3) in [-Π, Π]
(iii) Sin(x) and Sin(2x + 3) in [-Π, Π] simultanously

```
--> wxplot2d ( sin ( x ) , [ x , − %pi , %pi ] ) ;
```

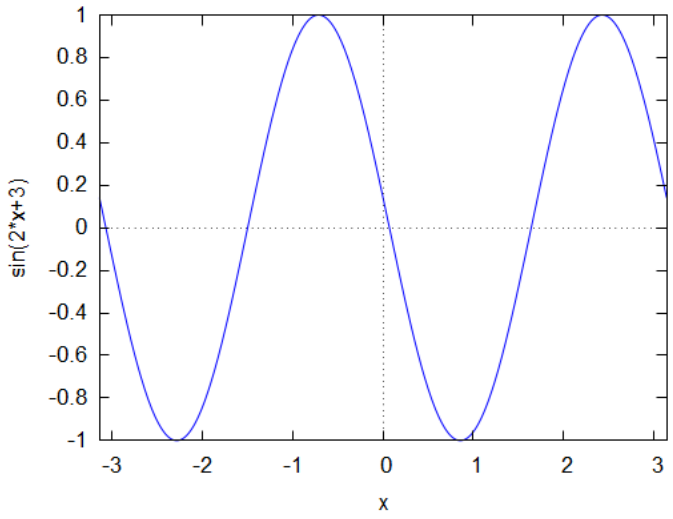
(%t3)



(%o3)

```
--> wxplot2d ( sin ( 2 · x + 3 ) , [ x , − %pi , %pi ] ) ;
```

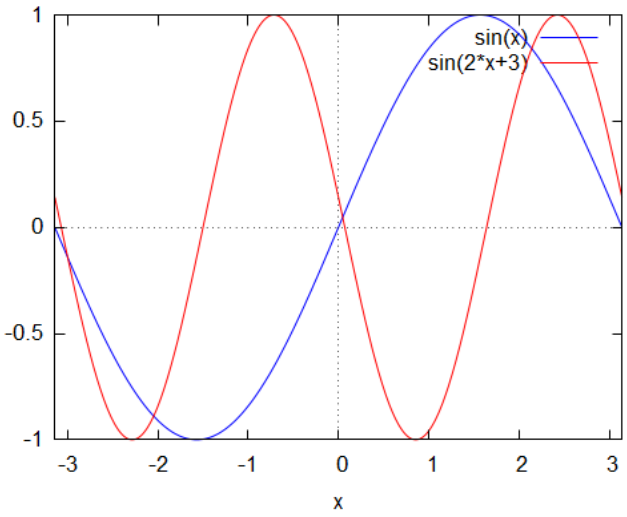
(%t4)



(%o4)

```
--> wxplot2d ( [ sin ( x ) , sin ( 2 · x + 3 ) ] , [ x , − %pi , %pi ] ) ;
```

(%t5)



(%o5)

Q plot the graph of
f(x) = 5*x + 3
g(x) = x
h(x) = x - 2
z(x) = -2 * x
in [-3, 3] simultanuosly.
Find the points of intersections of these lines

```
--> f ( x ) : = 5 · x + 3 ;
    g ( x ) : = x ;
    h ( x ) : = x − 2 ;
    z ( x ) : = − 2 · x ;
```

(%o6) $\mathrm{f}(x) := 5x + 3$

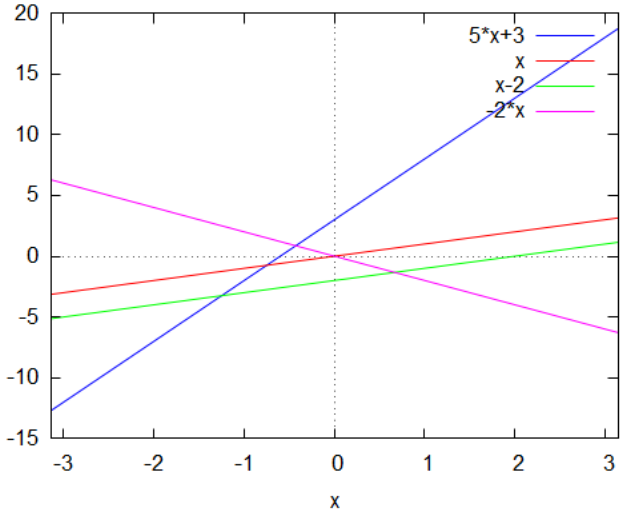
(%o7) $\mathrm{g}(x) := x$

(%o8) $\mathrm{h}(x) := x - 2$

(%o9) $\mathrm{z}(x) := (-2)x$

```
--> wxplot2d ( [ f ( x ) , g ( x ) , h ( x ) , z ( x ) ] , [ x , − %pi , %pi ] ) ;
```

(%t10)



(%o10)

--> solve (f (x) = g (x)) ;

(%o11) $[x = -\frac{3}{4}]$

--> solve (f (x) = h (x)) ;

(%o12) $[x = -\frac{5}{4}]$

--> solve (f (x) = z (x)) ;

(%o13) $[x = -\frac{3}{7}]$

--> solve (g (x) = h (x)) ;

(%o14) []

--> solve (g (x) = z (x)) ;

(%o15) $[x = 0]$

--> solve (h (x) = z (x)) ;

(%o16) $[x = \frac{2}{3}]$

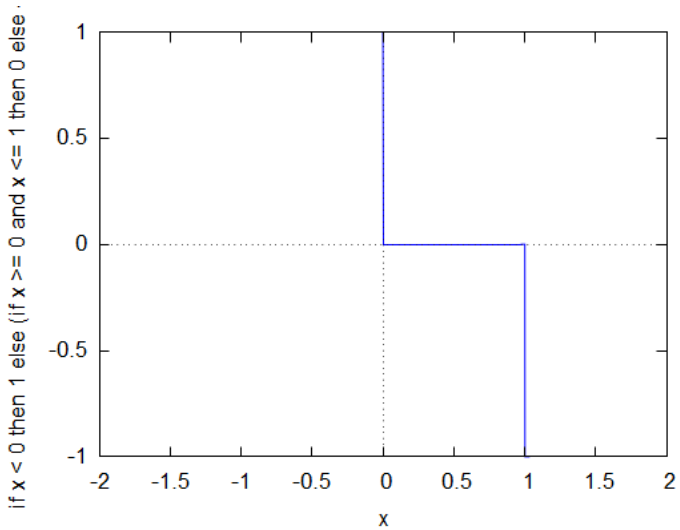
Q Plot the piecewise function defined as
f(x)= 0 if x < 0, 0 for 0 ≤ x ≤ 1, -1 for x > 1

--> f (x) : = if x < 0 then 1 else if x ≥ 0 and x ≤ 1 then 0 else − 1 ;

\tag{%o17} \operatorname{f}(x)\operatorname{:=}\operatorname{if}\operatorname{ }x\operatorname{< }0\operatorname{ }\operatorname{then}\operatorname{ }1\operatorname{ }\operatorname{e

--> wxplot2d (f (x) , [x , − 2 , 2]) ;

(%t18)



(%o18)

Q Expand (x-1)^4

--> expand ((x − 1) ^ 4) ;

(%o19) $x^4 - 4x^3 + 6x^2 - 4x + 1$

Q Find the roots of x^4 + x^2 + 1 = 0

--> solve (x ^ 4 + x ^ 2 + 1 = 0) ;

(%o20) $[x = -\frac{\sqrt{\sqrt{3}\%i - 1}}{\sqrt{2}}, x = \frac{\sqrt{\sqrt{3}\%i - 1}}{\sqrt{2}}, x = -\frac{\sqrt{-\sqrt{3}\%i - 1}}{\sqrt{2}}, x = \frac{\sqrt{-\sqrt{3}\%i - 1}}{\sqrt{2}}]$

--> multiplicities ;

(%o21) $[1, 1, 1, 1]$

Q Find the first, second and third derivatives of following functions
f(x)= sec(x)
g(x)= |x|
h(x)= x^(1/2) + log(x)

--> f (x) : = sec (x) ;
g (x) : = abs (x) ;
h (x) : = x ^ (1 / 2) + log (x) ;

(%o22) $\mathrm{f}(x) := \sec(x)$

(%o23) $\mathrm{g}(x) := |x|$

(%o24) $\mathrm{h}(x) := x^{\frac{1}{2}} + \log(x)$

--> for i : 1 while i ≤ 3 do print (diff (f (x) , x , i)) ;

$\sec(x)\tan(x)\sec(x)\tan(x)^2 + \sec(x)^3\sec(x)\tan(x)^3 + 5\sec(x)^3\tan(x)$

(%o25) *done*

--> for i : 1 while i ≤ 3 do print (diff (g (x) , x , i)) ;

$\frac{x}{|x|}00$

(%o26) *done*

--> for i : 1 while i ≤ 3 do print (diff (h (x) , x , i)) ;

$\frac{1}{2\sqrt{x}} + \frac{1}{x} - \frac{1}{4x^{\frac{3}{2}}} - \frac{1}{x^2}\frac{3}{8x^{\frac{5}{2}}} + \frac{2}{x^3}$

(%o27) *done*

Q Find the indefinate integral of xlog(x) and sin³(x)*cos²(x)
also find ∫xlog(x) from 0 to e and ∫sin³(x)*cos²(x) from -π to π

--> f (x) : = x · log (x) ;

(%o28) $\mathrm{f}(x) := x\log(x)$

--> g (x) : = (sin (x) ^ 3) · (cos (x) ^ 2) ;

(%o29) $\mathrm{g}(x) := \sin(x)^3\cos(x)^2$

--> integrate (f (x) , x) ;

(%o30) $\frac{x^2\log(x)}{2} - \frac{x^2}{4}$

--> integrate (g (x) , x) ;

(%o31) $\frac{3\cos(x)^5 - 5\cos(x)^3}{15}$

--> integrate (f (x) , x , 0 , %e) ;

(%o32) $\frac{\%e^2}{4}$

--> integrate (g (x) , x , − %pi , %pi) ;

(%o33) 0

Q Find 12Σi=1 √i

--> ∑ (sqrt (i) , i , 1 , 12) ;

(%o34) $\sqrt{11}+\sqrt{10}+\sqrt{7}+\sqrt{6}+\sqrt{5}+3^{\frac{3}{2}}+3\sqrt{2}+6$

Q Find the values of x and y satisfying the equations x² - y² = 0 and 2y² + x² - x - y - 1 = 0

--> solve ([x ^ 2 − y ^ 2 = 0 , 2 · y ^ 2 + x ^ 2 − x − y − 1 = 0]) ;

(%o35) $[[y=-\frac{1}{\sqrt{3}},x=\frac{1}{\sqrt{3}}],[y=\frac{1}{\sqrt{3}},x=-\frac{1}{\sqrt{3}}],[y=-\frac{1}{3},x=-\frac{1}{3}],[y=1,x=1]]$

Q Find the solution for x + y = 2, x + y = 3

--> solve ([x + y = 2 , x + y = 3]) ;

(%o36) []

Q Find the solution for x + y = 2, 2x + 2y = 4

--> solve ([x + y = 2 , 2 · x + 2 · y = 4]) ;

solve: dependent equations eliminated: (2)

(%o37) $[[y=2-\%r1,x=\%r1]]$

Q Find the solution for x + y + z = -1, x - y + z = 5, 2x + 2y +2z = -2

--> solve ([x + y + z = − 1 , x − y + z = 5 , 2 · x + 2 · y + 2 · z = − 2]) ;

solve: dependent equations eliminated: (3)

(%o38) $[[z=2-\%r2,y=-3,x=\%r2]]$
