Lucky Lao

DSC-VI : Practical-03

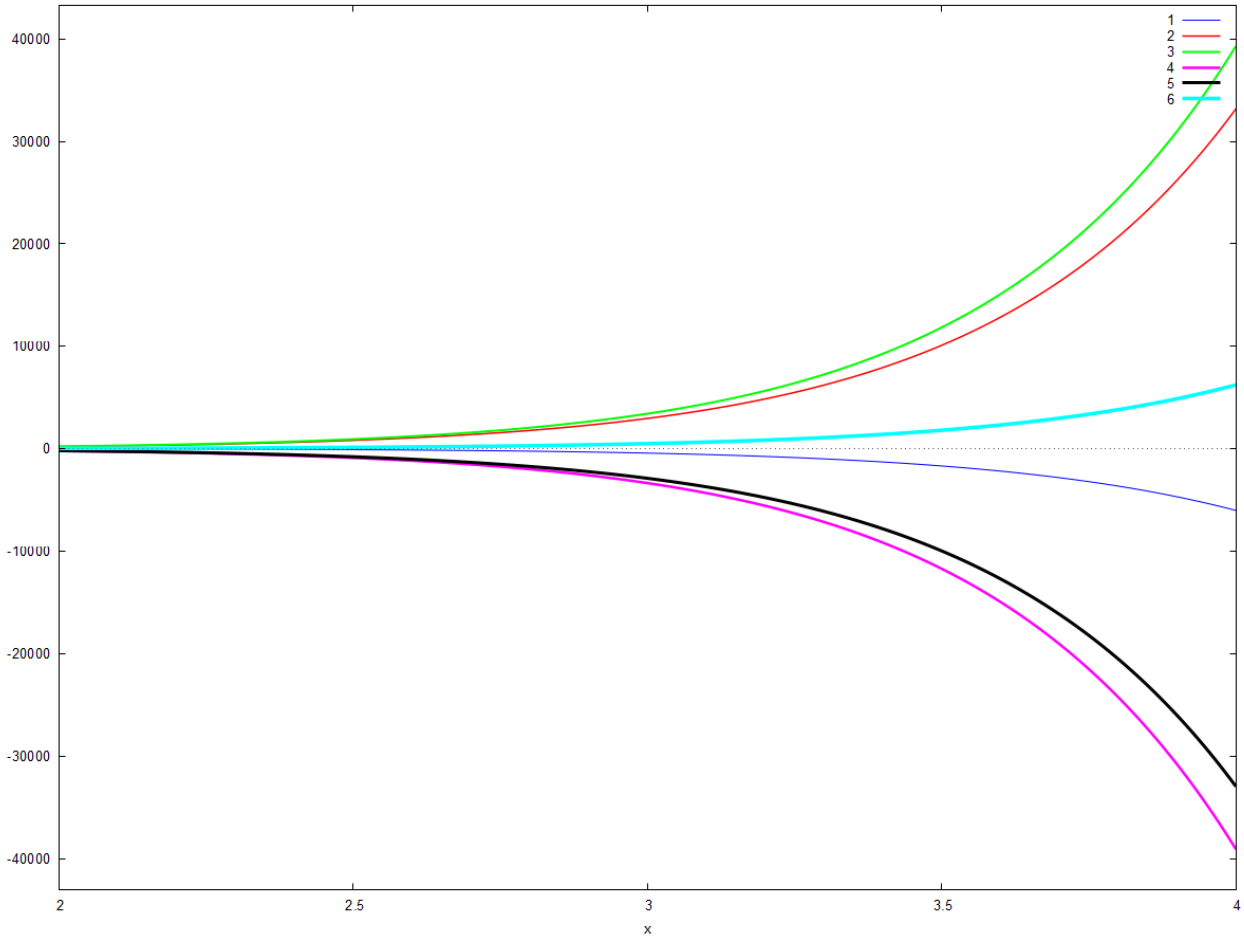
Family of Solutions: Third Order Differential Equations

We'll now plot the family of solutions of the following third order differential equations:

1 y''' - 5y'' + 8y' - 4y = 0

```
--> kill ( all ) $
    de : diff ( y ( x ) , x , 3 ) − 5 · diff ( y ( x ) , x , 2 ) + 8 · diff ( y ( x ) , x ) − 4 · y ( x ) = 0 $
    gsol : desolve ( de , y ( x ) ) $
    psol : ev ( gsol , y ( 0 ) = c1 , diff ( y ( x ) , x ) = c2 , diff ( y ( x ) , x , 2 ) = c3 ) $
    s1 : ev ( psol , c1 = 1 , c2 = 2 , c3 = 3 ) $
    s2 : ev ( psol , c1 = 2 , c2 = 1 , c3 = 3 ) $
    s3 : ev ( psol , c1 = 3 , c2 = 1 , c3 = 2 ) $
    s4 : ev ( psol , c1 = 1 , c2 = 3 , c3 = 2 ) $
    s5 : ev ( psol , c1 = 2 , c2 = 3 , c3 = 1 ) $
    s6 : ev ( psol , c1 = 3 , c2 = 2 , c3 = 1 ) $

    wxplot2d ( [ rhs ( s1 ) , rhs ( s2 ) , rhs ( s3 ) , rhs ( s4 ) , rhs ( s5 ) , rhs ( s6 ) ] ,
          [ x , 2 , 4 ] ,
          [ style , [ lines , 1 ] , [ lines , 1 . 5 ] , [ lines , 2 ] , [ lines , 2 . 5 ] , [ lines , 3 ] , [ lines , 3 . 5 ] ] ,
          [ legend , "1" , "2" , "3" , "4" , "5" , "6" ] ) $
```



2 y''' - 12y'' + 48y' - 64y = 12 - 32exp(-8x) + 2exp(4x)

```
--  kill ( all ) $
>   de : diff ( y ( x ) , x , 3 ) − 12 · diff ( y ( x ) , x , 2 ) + 48 · diff ( y ( x ) , x ) − 64 · y ( x ) = 12 − 32 · exp
    ( − 8 · x ) + 2 · exp ( 4 · x ) $
    gsol : desolve ( de , y ( x ) ) $
    psol : ev ( gsol , y ( 0 ) = k1 , diff ( y ( x ) , x ) = k2 , diff ( y ( x ) , x , 2 ) = k3 ) $
    s1 : ev ( psol , k1 = 1 , k2 = 2 , k3 = 3 ) $
    s2 : ev ( psol , k1 = 2 , k2 = 1 , k3 = 3 ) $
    s3 : ev ( psol , k1 = 3 , k2 = 2 , k3 = 1 ) $
    s4 : ev ( psol , k1 = 1 , k2 = 3 , k3 = 2 ) $
    s5 : ev ( psol , k1 = 2 , k2 = 3 , k3 = 1 ) $
    s6 : ev ( psol , k1 = 3 , k2 = 1 , k3 = 2 ) $

    wxplot2d ( [ rhs ( s1 ) , rhs ( s2 ) , rhs ( s3 ) , rhs ( s4 ) , rhs ( s5 ) , rhs ( s6 ) ] ,
          [ x , 3 , 5 ] ,
          [ style , [ lines , 1 ] , [ lines , 1 . 5 ] , [ lines , 2 ] , [ lines , 2 . 5 ] , [ lines , 3 ] , [ lines , 3 . 5 ] ] ,
          [ legend , "1" , "2" , "3" , "4" , "5" , "6" ] ) $
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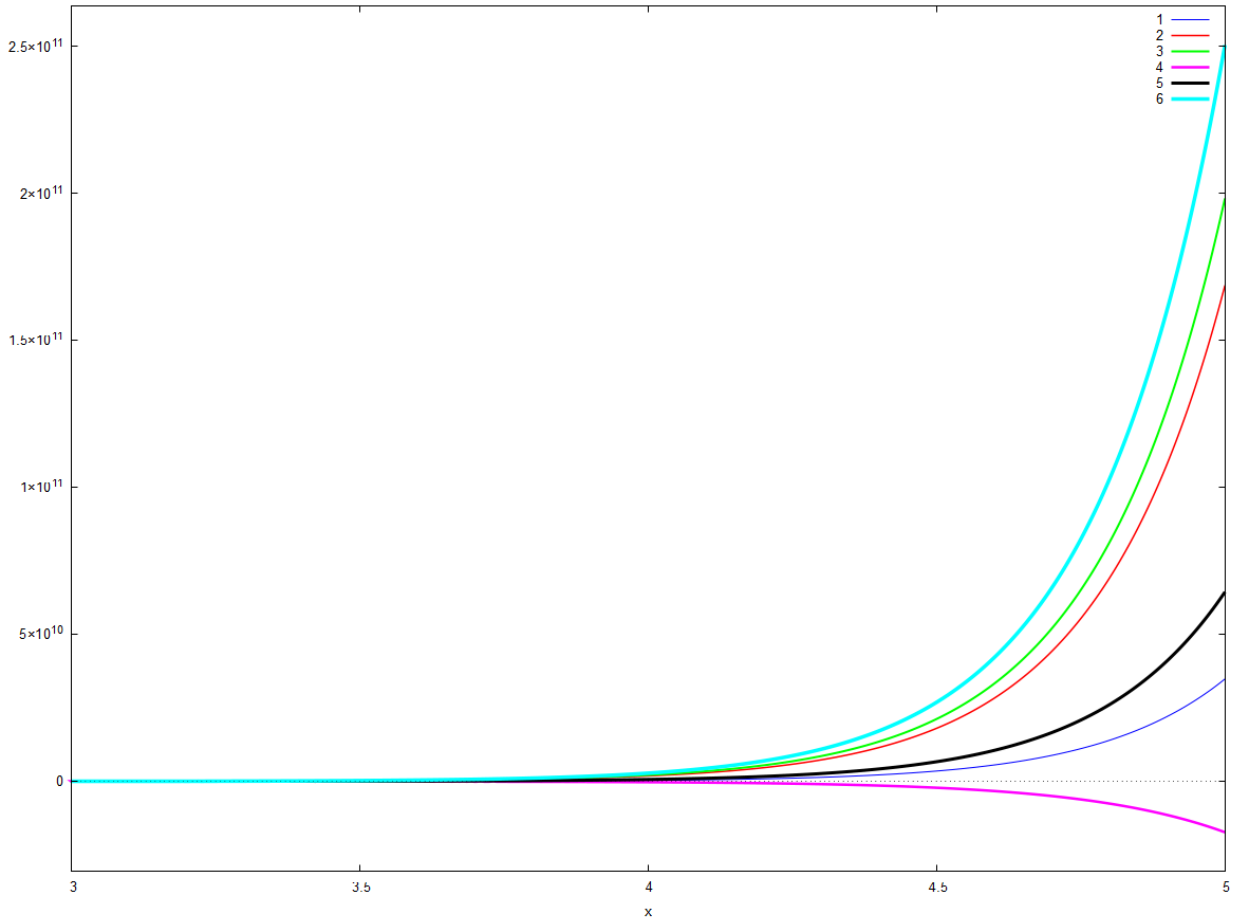

Created with wxMaxima.
The source of this Maxima session can be downloaded here.