SOLUTION TO ACTIVITIES

Module 1, Unit 1, Activity 1

Let y, the solution be defined by

$$y = c_0 + c_1 x + c_2 x^2 + \cdots = \sum_{0}^{\infty} c_m x^n$$

With y' and y'' given by $y' = c_1 + 2c_1 + 2c_1 x + 3c_3 x^2 + \cdots = \sum_1^{\infty} m(m-1)c_m x^{m-1}$;

$$y'' = 2c_1 + 3.2c_3 x + 4.3c_4 x^2 + \cdots = \sum_{2}^{\infty} m(m-1)c_m x^{m-2}$$

Then substitute for y, y' and y'' in $y'' - 3y' + 2y = 0$ you obtain

$\sum m(m-1)\, c_m x^{m-2} + 2\sum c_m x^m = 0$ sum of coefficients of x_s is the same as $B_s$as

$B_{i=}0,\ i = 0,1,2, \ldots$

B_0: $2.1c_2 - 3c_1 + 2c_0 = 0$ up to B_s which is $(s+2)(s+1)c_{s+2} - 3(s+1)$

$c_{s+1} + 2c_s = 0, s = 0,1,2, \ldots$ taking c_0 and c_1 as arbitrary constants then the B_0 to

$B_s$becomes $c_2 = \frac{3}{2}c_1 - c_0$, $c_3 = \frac{7}{3\,.\,2}c_1 - c_0$ etc.

Module 2, Unit 1, Activity 1

$$\beta(p,q) = 2\int_0^{\frac{\pi}{2}} \sin^{2p-1}\theta \cos^{2q-1}\theta \, d\theta$$

Let $2p - 1 = \alpha$ then $p = \frac{\alpha+1}{2}$;

$2q - 1 = 0$ then $q = \frac{1}{2}$

$$\therefore \beta\left(\frac{\alpha+1}{2}, \frac{1}{2}\right) = 2\int_0^{\frac{\pi}{2}} \sin\alpha\,\theta \, d\theta$$

That is $\int_0^{\frac{\pi}{2}} \sin\alpha\,\theta \, d\theta = \frac{1}{2}\beta\left(\frac{\alpha+1}{2}, \frac{1}{2}\right)$

Module 2, Unit 2, Activity 2

General Solution for $8x(1-x)y'' + (4-14x)y' - y = 0$ is
$A(1-x)^{-\frac{1}{4}} + B\sqrt{x}\, F\left(1, \frac{3}{4}, \frac{3}{2}; x\right)$

Module 2, Unit 3, Activity 2

The prove of $\int_0^{\frac{\pi}{2}} J_0\,(z\cos\theta)\cos\theta\, d\theta = \frac{\sin z}{z}$ has been solved inside the manual, so check it up!

Module 3, Unit 2, Activity 2

From $L\big(f(\mu t)\big) = \frac{1}{\mu}F(s/\mu)$ and $L(\sin t) = \frac{1}{s^2+1}$

$$L(\sin\mu t) = \frac{1}{\mu}\left(\frac{1}{(s/\mu)^2+1}\right) = \frac{1}{\mu}\frac{z}{s^2+\mu^2} = \frac{\mu}{s^2+\mu^2}$$