By two different methods (one of them is by using the Gamma function) evaluate

 $\sin^4 x \cos^5 x \, dx = \frac{8}{315}$ 

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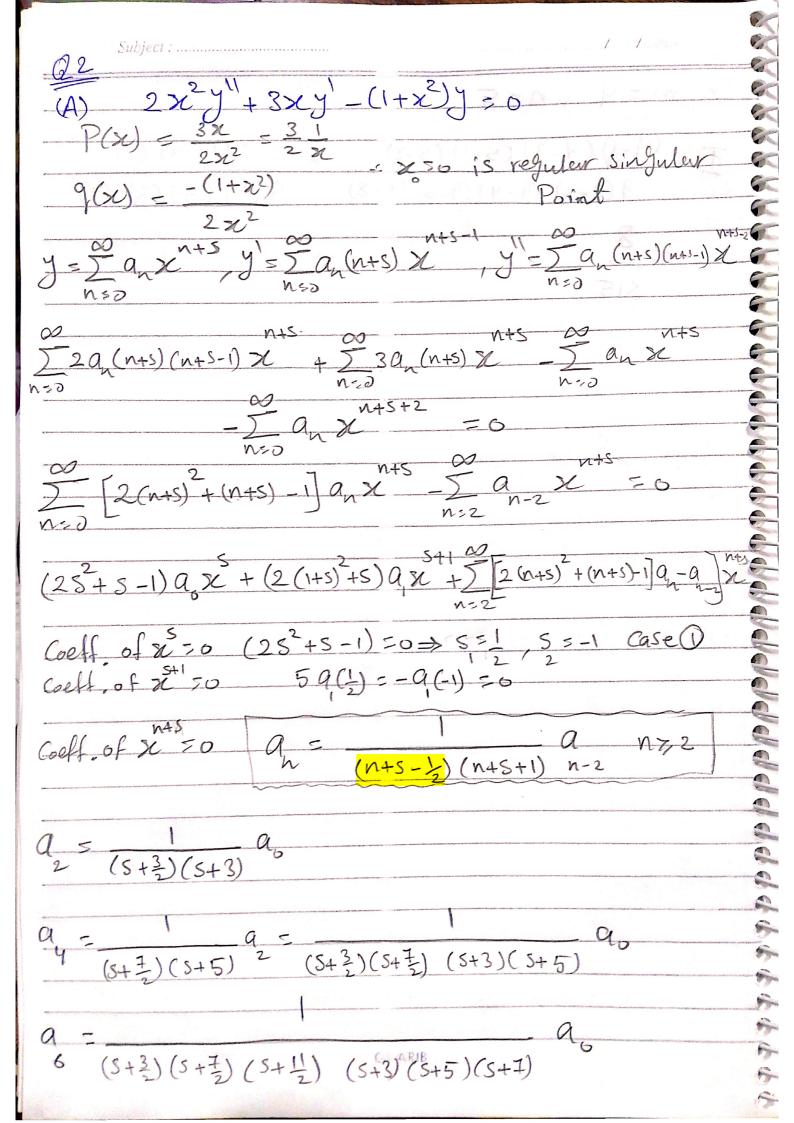
Question (2): (16 Marks) Find two linearly independent solutions in powers of "x" for the following differential equation:

(A) Find two linearly independent solutions 
$$2x^2y'' + 3xy' - (1+x^2)y = 0$$

Use  $e^x = z$  to solve in terms of Bessel functions the following differential equation:

$$y'' + (3e^{2x} - 4)y = 0.$$

[5 Marks]

Second method: walli's Rule If m, n are bothodd the integers or one odd the integer 

 $= \frac{1}{2x} \left[ (5+\frac{3}{2})(s+\frac{7}{2}) - - - (s+n-\frac{1}{2}) \right] \left[ (s+3)(s+5) - - - - (s+n+1) \right]$ For S = 1 > 2 (1) = [2.4.6 --- (2K)][7.15 -- (2K+3)] For  $S = -1 \Rightarrow 9(-1) = \frac{1}{2k} \left[\frac{1}{2} \cdot \frac{5}{2} \cdot \frac{9}{3} - -(2k - \frac{3}{2})\right] \left[2 - 4 - 6 - -(2k)\right]$  $y(x,s) = \sum_{n=0}^{\infty} a(\frac{1}{2}) \times x^{n+\frac{1}{2}}$ J2(x,52) = J Q (-1) X y = C, y, + C, y, gs.  $= C\sqrt{X} \sum_{N=2}^{\infty} Q(\frac{1}{2}) \times \frac{1}{X} + \frac{C_2}{X} \sum_{N=2}^{\infty} Q(-1) \times \frac{1}{X}$ 

use ex= 7 to solve in terms of Bessel functions the following differential equations;

$$y'' = \frac{d}{dx} \left( \frac{dy}{dx} \right) = \frac{d}{dz} \left( \frac{z}{z} \frac{dy}{dz} \right) \frac{dz}{dx} = z \left[ \frac{dy}{dz} + z \frac{d^2y}{dz^2} \right]$$
$$= \frac{z}{z} \frac{dy}{dz} + \frac{z^2}{z^2} \frac{d^2y}{dz^2}$$