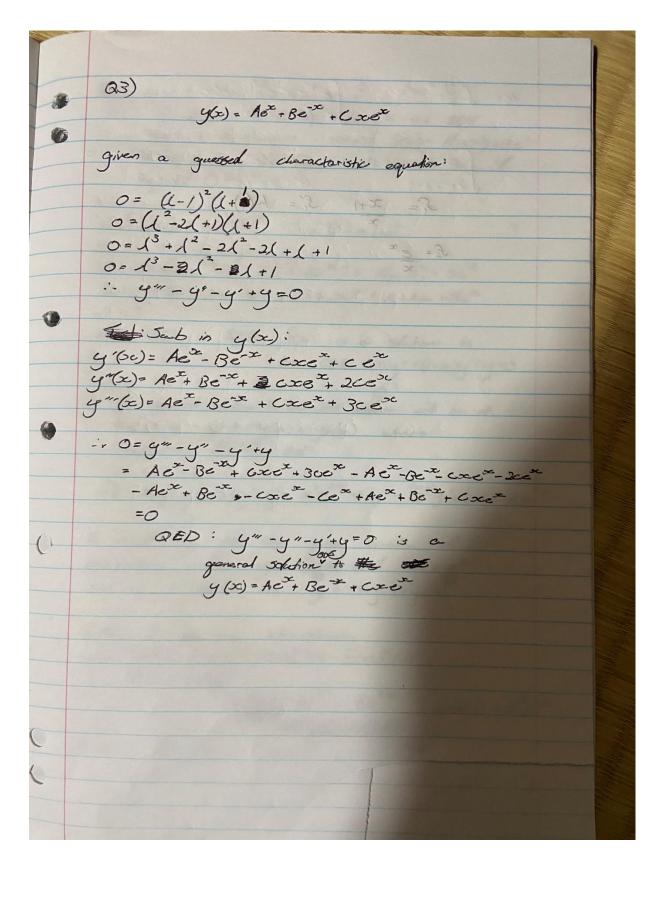
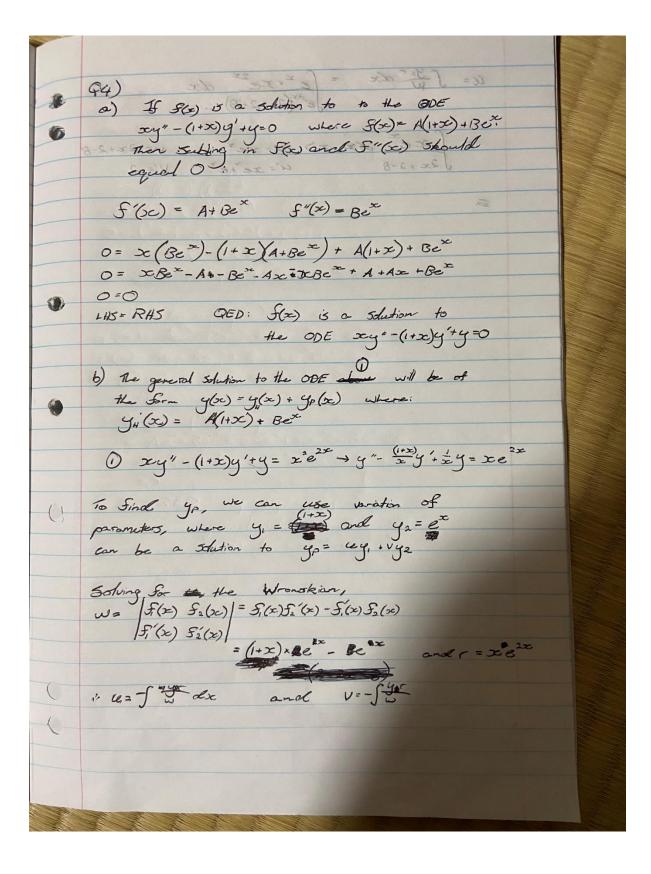
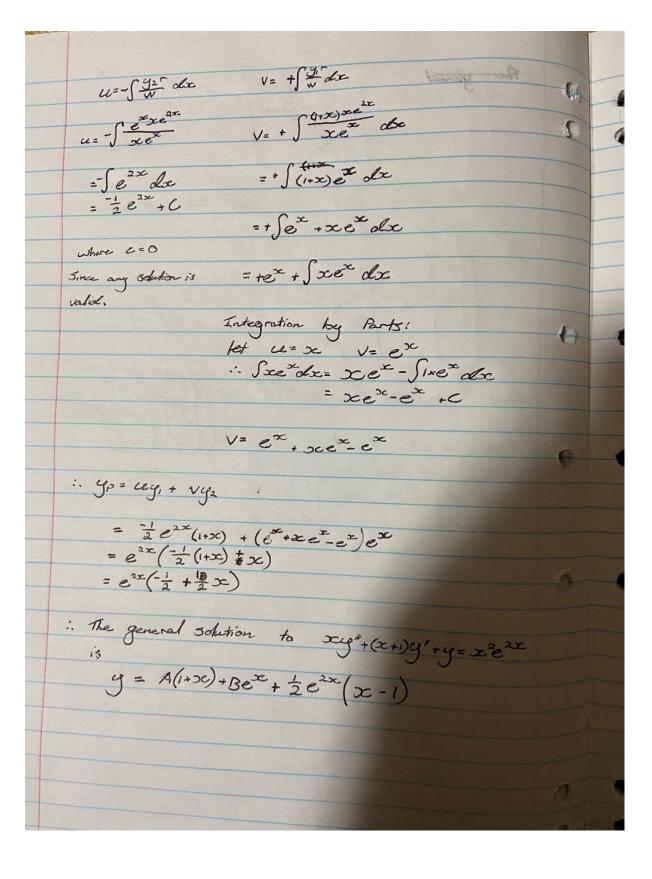
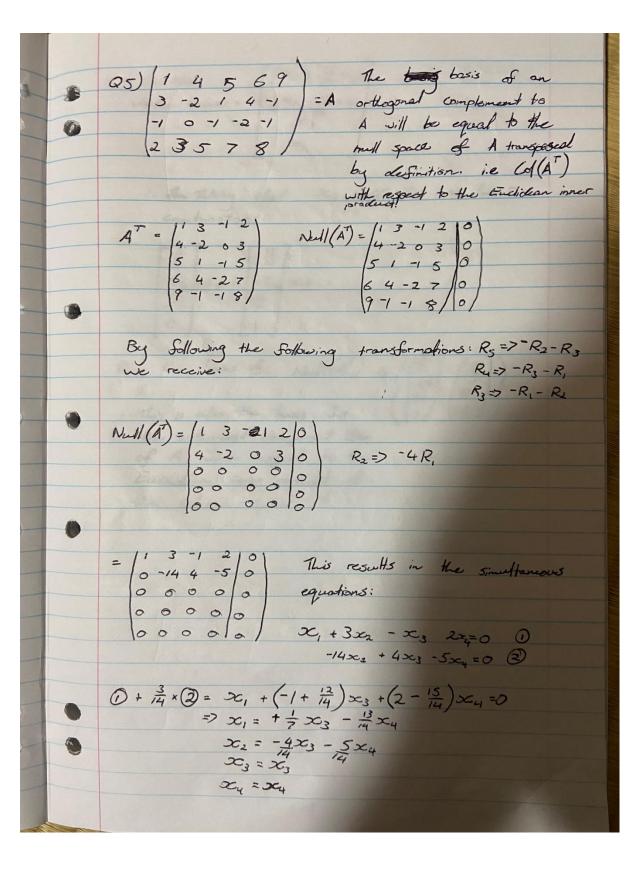


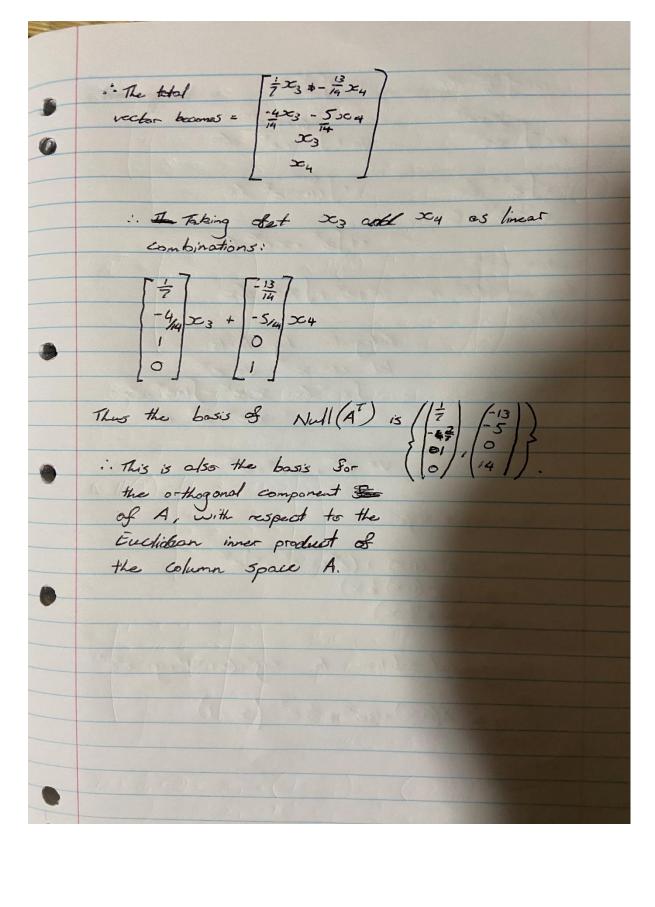
02) y-3+(x+2y) = 0 y(0)=-3 Since ODE 15 of form: 1750, y) + O(x, y) \$ =0 We see that: $\frac{df}{dy} = 1$ and $\frac{df}{dx} = 1$.. $\frac{df}{dy} = \frac{dg}{dx}$ then there is some f(x,y) where: $\frac{d}{dx} f(x,y) = p(x,y) \quad \frac{d}{dy} f(x,y) = o(x,y)$: Sy-3 de = xy-3x + g(y) Sx+2ydy= xy+y2 + m(x) :. $g(y) = y^2$ and m(x) = -3x:. f(x,y)= C = xy-3x +y2 y(0)=3 C=0-\$40+9 ... C=9 9= 300 + 42

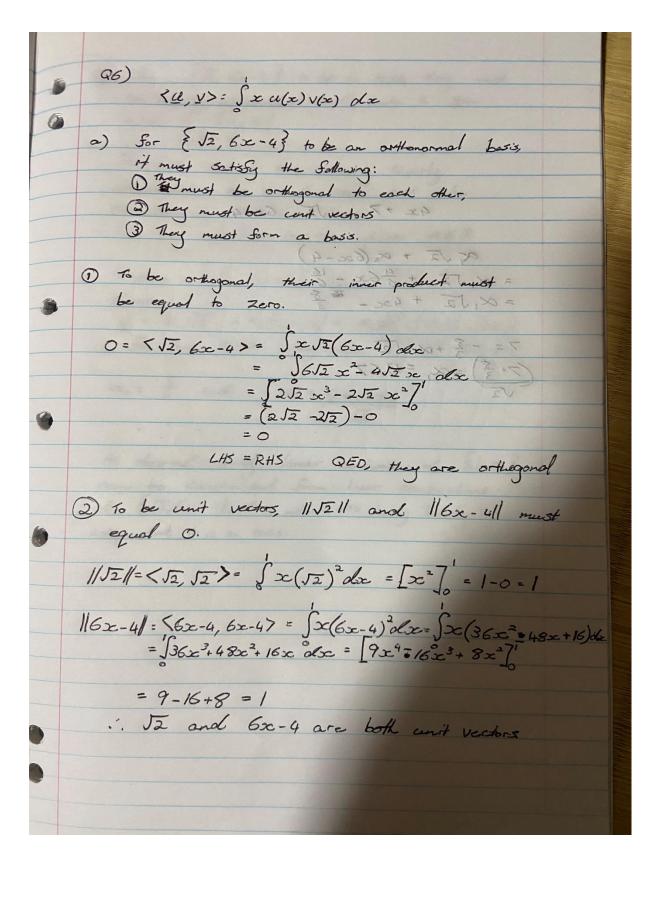












(3) For \{ \frac{1}{2}, 6x-4 \} to be a basis, they must be linearly independent and have a span equal to E1, x3. Ja and 600-4 are clearly linearly independent no A could ever make the Solbwing Statement true: AJZ = 6x-4 Where AER To prove { \(\int 2, 6x - 4 \} \) spans { \(\int 1, x \} we $V = \alpha$, $\sqrt{2} + \alpha_2(6x-4) = \alpha_2 \frac{6x}{100} + (\alpha_1 \sqrt{2} - 4\alpha_2)$ For some vector within space [1, x]: Fx + 12 $\alpha_2 = \frac{\pi}{6}$ and $\alpha_1 = \frac{\pi}{1 + 4\alpha_2}$ As observed, and linear combination of El, x} can be constructed from linear combinations of {J2,6x-4}. Thus, with it also being linearly independent, it is a basis.

b) for 1/x2-ast -6(6x-4)11 to be minimised, when we can use Best Approximation V= >c2 and u= +av +b (6>c-4) 11 V - Proje (V) 11 where V=x2 Project (1) = at = +6(6x-4) Proj. (V) = < V.e, >e, + (V, e2)e2 ... a 52 + b(6x-4) = <x2, 527 52 + <x2, 6x-47 (6x-4) $a = \langle x^2, J_2 \rangle$ $b = \langle x^2, 6x - 4 \rangle$ $= \int x \cdot x^2 \cdot J_2 dx$ $= \int x \cdot x^3 \cdot (6x - 4) dx$ $= J_2 \left[\frac{1}{3} x^3 \right]^3 = \int 6x^9 - 4x^4 dx$ a= <x; 527 $= \int x^6 - \frac{4}{5} \times \int_{5}^{6} = 1 - \frac{4}{5} = \frac{1}{5}$ in For $1/x^2-aJ_2-b(6x-4)$ to be minimised, a send 6 must equal $\frac{J_2}{4}$ and $\frac{J_3}{5}$ respectively as given by the Best Approximation Theorem.