ex4a 8th September - Joseph Witten

Q1def, Q2def, Q3cd

Q1)

- d)

$(1+x)^{5/3}$

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + ...$

$1 + (\frac{5}{3})x + \frac{(\frac{5}{3})(\frac{5}{3}-1)x^2}{2!} + \frac{(\frac{5}{3}-1)(\frac{5}{3}-2)x^3}{3!} + ...$

$1 + (\frac{5}{3})x + \frac{5}{9}x^2 + \frac{1}{18}x^3 + ...$

$|x| < 1$

- e)

$(1+x)^{-5/3}$

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + ...$

$1 + (\frac{-5}{3})x + \frac{(\frac{-5}{3})(\frac{-5}{3}-1)x^2}{2!} + \frac{(\frac{-5}{3}-1)(\frac{-5}{3}-2)x^3}{3!} + ...$

$1 + (\frac{-5}{3})x + \frac{20}{9}x^2 + \frac{44}{27}x^3 + ...$

$|x| > -1$

- f)

$(1+x)^{-3/2}$

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + ...$

$1 + (\frac{-3}{2})x + \frac{(\frac{-3}{2})(\frac{-3}{2}-1)x^2}{2!} + \frac{(\frac{-3}{2}-1)(\frac{-3}{2}-2)x^3}{3!} + ...$

$1 + (\frac{-3}{2})x + \frac{15}{8}x^2 + \frac{35}{24}x^3 + ...$

$|x| > -1$

Q2) - d)

$(1-3x)^{7/3}$

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + ...$

$1 + (\frac{7}{3})3x + \frac{(\frac{7}{3})(\frac{7}{3}-1)(3x)^2}{2!} + \frac{(\frac{7}{3}-1)(\frac{7}{3}-2)(3x)^3}{3!} + ...$

$1 + 7x + \frac{(\frac{7}{3})(\frac{4}{3})9x^2}{2!} + \frac{(\frac{4}{3})(\frac{1}{3})27x^3}{3!} + ...$

$1 + 7x + \frac{14}{3}x^2 + 72x^3 + ...$

$|x| < 1$

- e)

$(1-6x)^{\frac{-2}{3}}$

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + ...$

$1 + (\frac{-2}{3})6x + \frac{(\frac{-2}{3})(\frac{-2}{3}-1)(6x)^2}{2!} + \frac{(\frac{-2}{3}-1)(\frac{-2}{3}-2)(6x)^3}{3!} + ...$

$1 - 4x + \frac{(\frac{-2}{3})(\frac{-5}{3})36x^2}{2!} + \frac{(\frac{-4}{3})(\frac{-8}{3})216x^3}{3!} + ...$

$1 - 4x + 20x^2 + 128x^3 + ...$

$|x| > -1$

- f)

$(1-\frac{3}{4}x)^{\frac{-5}{3}}$

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + ...$

$1 + (\frac{-5}{3})(\frac{-3}{4}x) + \frac{(\frac{-5}{3})(\frac{-5}{3}-1)(\frac{-3}{4}x)^2}{2!} + \frac{(\frac{-5}{3}-1)(\frac{-5}{3}-2)(\frac{-3}{4}x)^3}{3!} + ...$

$1 - \frac{3}{4}x + \frac{(\frac{-5}{3})(\frac{-8}{3})\frac{9}{16}x^2}{2!} + \frac{(\frac{-8}{3})(\frac{-11}{4})\frac{-27}{64}x^3}{3!} + ...$

$1 + \frac{3}{4}x + \frac{5}{4}x^2 + \frac{-33}{64}x^3 + ...$

$|x| < 1$

Q3) - c)

$\sqrt{1-x}$

$(1-x)^{\frac{1}{2}}$

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + ...$

$1 - \frac{1}{2}x + \frac{(\frac{1}{2})(\frac{-1}{2})(-x)^2}{2!} + \frac{(\frac{1}{2})(\frac{-1}{2})(\frac{-3}{2})(-x)^3}{3!} + ...$

$1 - \frac{1}{2}x + \frac{-1}{8}x^2 + \frac{-1}{16}x^3 + ...$

$|x| < 1$

- d)

$\sqrt[3]{1-3x}$

$(1-3x)^{\frac{1}{3}}$

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + ...$

$1 - \frac{1}{3}x + \frac{(\frac{1}{3})(\frac{-2}{3})(-x)^2}{2!} + \frac{(\frac{1}{3})(\frac{-2}{3})(\frac{-4}{3})(-x)^3}{3!} + ...$

$1 - \frac{1}{3}x + \frac{-1}{9}x^2 + \frac{-4}{81}x^3 + ...$

$|x| < 1$