

ex4a 8th September - Joseph Witten

Q1def, Q2def, Q3cd

Q1)

• d)

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

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

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

$$1 + \left(\frac{5}{3}\right)x + \frac{5}{9}x^2 - \frac{5}{81}x^3 + \dots$$

$$|x| < 1$$

• e)

$$(1+x)^{-1/4}$$

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

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

$$1 + \left(\frac{-1}{4}\right)x + \frac{5}{32}x^2 - \frac{15}{128}x^3 + \dots$$

$$|x| > -1$$

• f)

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

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

$$1 + \left(\frac{-3}{2}\right)x + \frac{\left(\frac{-3}{2}\right)\left(\frac{-3}{2}-1\right)x^2}{2!} + \frac{\frac{-3}{2}\left(\frac{-3}{2}-1\right)\left(\frac{-3}{2}-2\right)x^3}{3!} + \dots$$

$$1 + \left(\frac{-3}{2}\right)x + \frac{15}{8}x^2 - \frac{35}{16}x^3 + \dots$$

$$|x| < 1$$

Q2) - d)

$$(1-5x)^{7/3}$$

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

$$1 + \left(\frac{7}{3}\right)5x + \frac{\left(\frac{7}{3}\right)\left(\frac{7}{3}-1\right)(5x)^2}{2!} + \frac{\frac{7}{3}\left(\frac{7}{3}-1\right)\left(\frac{7}{3}-2\right)(5x)^3}{3!} + \dots$$

$$1 - \frac{35}{3}x + \frac{\left(\frac{7}{3}\right)\left(\frac{4}{3}\right)9x^2}{2!} + \frac{\frac{7}{3}\left(\frac{4}{3}\right)\left(\frac{1}{3}\right)27x^3}{3!} + \dots$$

$$1 - \frac{35}{3}x + \frac{350}{9}x^2 + \frac{1750}{81}x^3 + \dots$$

$$|x| < \frac{1}{5}$$

• e)

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

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

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

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

$$1 - 4x + 20x^2 + \frac{320}{3}x^3 + \dots$$

$$|x| < \frac{1}{6}$$

• f)

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

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

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

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

$$1 + \frac{5}{4}x + \frac{5}{4}x^2 + \frac{55}{48}x^3 + \dots$$

$$|x| < \frac{4}{3}$$

Q3) - c)

$$\sqrt{1-x}$$

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

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

$$1 - \frac{1}{2}x + \frac{\left(\frac{1}{2}\right)\left(\frac{-1}{2}\right)(-x)^2}{2!} + \frac{\left(\frac{1}{2}\right)\left(\frac{-1}{2}\right)\left(\frac{-3}{2}\right)(-x)^3}{3!} + \dots$$

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

$$|x| < 1$$

• d)

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

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

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

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

$$1 - x - x^2 - \frac{5}{3}x^3 + \dots$$

$$|x| < \frac{1}{3}$$