Math Primer Exercises 1

BINOMIAL SERIES

[easy] 1. Expand $(1+x)^7$

[medium] 2a. Write out 5 terms in the expansion of $\sqrt{1.2}$

[easy] 2b. Quickly approximate $\sqrt{1.2}$

[medium] 2c. Quickly approximate $\sqrt{5}$

[hard] 3. Einstein discovered that for an object of ***rest mass*** m, moving with ***relativistic momentum*** p, the relationship between m, p and its ***total relativistic energy***, E, is: $E^2 = m^2c^4 + p^2c^2$.

a. Take the positive square root and factor out mc^2 from within the radical sign.

b. Given that the relativistic definition of momentum is $p = \dfrac{mv}{\sqrt{1-\dfrac{v^2}{c^2}}}$ insert this into question 2a's equation and simplify until you obtain a single term with the denominator as $\sqrt{1-\dfrac{v^2}{c^2}}$.

c. Write this quotient as a product and apply the binomial approximation to the radical term.

d. Multiply through.

e. What does this new equation tell us?