

## Term 2 Week 7

1. Find all polynomials  $f(x)$  such that  $f(2x) = f'(x).f''(x)$
2. Let  $x, y$  and  $z$  be three 3-digit Real numbers that, between them, contain all the digits from 1-9.  
If:

- $x + y = z$
- $z$  is a power of a prime
- Each digit of  $x$  is lower than the corresponding digit of  $y$

Find  $x, y$  and  $z$ .

3. Suppose you have forgotten the formulas for the sine and cosine of a sum and a difference, but do remember the formula  $e^{z+w} = e^z e^w$ , with  $z, w \in \mathbb{C}$ .  
Use this formula to find formulas for  $\cos(A - B)$  and  $\sin(A + B)$  with  $A$  and  $B$  real.

Note: for this problem use Euler's Formula to represent a complex number in polar form:

$$e^{i\theta} = \cos \theta + i \sin \theta$$

4.  $\int \sin^2(x) \cos^2(x) dx$