CHAIN RULE

The Chain Rule is a rule of differentiation used to find the derivative of a function within another function. This is generally used when one term is bracketed and raised to an exponential power.

DIFFERENTIATE $(6x)^2$

In order to differentiate, one must first bring the exponent to the position out the front of the bracket. This is differentiating the "exponent term" and after this exponent has been moved out the front, you can simply rewrite the term in the bracket as is and subtract one from the exponent.

$$f(x) = (6x)^2$$

After this, the derivative of what is in the bracket is then multiplied by the rest of the function, hence the result looks like:

$$\therefore f'(x) = 2(6x)^{2-1}(6)$$

One can then simplify by getting the product of the constants and removing the exponent as the result is to the power of 1. This can then be simplified again using the distributive law.

$$\therefore f'(x) = 12(6x)$$
$$\therefore f'(x) = 72x$$

One can also be expected to work with surds and fractions for chain rule. An example involving both surds and fractions can be seen below. Again power rule and chain rule are applied:

$$f(x) = (6x^2 + \sqrt{3}x^{\frac{5}{6}})^{\frac{4}{13}}$$
$$\therefore f'(x) = \frac{4}{13}(6x^2 + \sqrt{3}x^{\frac{5}{6}})^{\frac{4}{13}-1}(12x + \frac{5}{6}\sqrt{3}x^{\frac{5}{6}-1})$$
$$\therefore f'(x) = \frac{4}{13}(6x^2 + \sqrt{3}x^{\frac{5}{6}})^{-\frac{9}{13}}(12x + \frac{5}{6}\sqrt{3}x^{-\frac{1}{6}})$$