

## Answer on Question #53276 – Math – Calculus

### Question

The  $n$ th derivative of the function  $t(x)$  where  $t(x) = 5x^6 - 9x^5 + 3x^3 - 0.5$  is a cubic function.

(a) State the value of  $n$ .

(b) Find the ratio of coefficient in  $x^3$  to the coefficient in  $x^2$  of the cubic function giving your answer in the form 1:k(1 is to k) where k is a fraction in its simplest form.

### Solution

(a) Let us take derivatives of  $t(x)$  until we get a cubic function.

$$\frac{d}{dx}t(x) = 30x^5 - 45x^4 + 9x^2$$

$$\frac{d^2}{dx^2}t(x) = \frac{d}{dx}\left(\frac{d}{dx}t(x)\right) = 150x^4 - 180x^3 + 18x$$

$$\frac{d^3}{dx^3}t(x) = \frac{d}{dx}\left(\frac{d^2}{dx^2}t(x)\right) = 600x^3 - 540x^2 + 18$$

$\frac{d^3}{dx^3}t(x)$  is cubic function, thus, 3<sup>rd</sup> derivative of the function  $t(x)$  is a cubic function, hence  $n = 3$ .

(b) The ratio of coefficient in  $x^3$  to the coefficient in  $x^2$ :

$$\frac{600}{-540} = -\frac{60}{54} = -\frac{20}{18} = -\frac{10}{9}$$

**Answer:**

(a) 3

(b)  $-\frac{10}{9}$