Answer on Question #48008 – Math – Calculus

The polynomial $f(x) = 2x^3 + 5x^2 + 3$ is given. Find $f(1.5), f'(1.5), f''(1.5), f'''(1.5)$ using synthetic division.

Solution:

1) $f(1.5)$=?

Calculate $\frac{2x^3+5x^2+3}{x-1.5}$ using synthetic division:

$$\begin{array}{r|cccc} 1.5 & 2 & 5 & 0 & 3 \\ & \downarrow & 3 & 12 & 18 \\ \hline & 2 & 8 & 12 & \mathbf{21} \end{array}$$

Remainder =21. So $f(1.5) = 21$.

2) $f'(1.5)$=?

Calculate $f'(x)$:

$$f'(x) = 6x^2 + 10x$$

Calculate $\frac{6x^2+10x}{x-1.5}$ using synthetic division:

$$\begin{array}{r|ccc} 1.5 & 6 & 10 & 0 \\ & \downarrow & 9 & 28.5 \\ \hline & 6 & 19 & \mathbf{28.5} \end{array}$$

Remainder =28.5. So $f'(1.5) = 28.5$.

3) $f''(1.5)$=?

Calculate $f''(x)$:

$$f''(x) = 12x + 10$$

Calculate $\frac{12x+10}{x-1.5}$ using synthetic division:

$$\begin{array}{r|cc} 1.5 & 12 & 10 \\ & \downarrow & 18 \\ \hline & 12 & \mathbf{28} \end{array}$$

Remainder =28. So $f''(1.5) = 28$.

4) $f'''(1.5)$=?

Calculate $f''(x)$:

$$f'''(x) = 12$$

Calculate $\frac{12}{x-1.5}$ using synthetic division:

$$\begin{array}{r|l} 1.5 & 12 \\ \hline & \downarrow \\ \hline & \mathbf{12} \end{array}$$

Remainder =12. So $f'''(1.5) = 12$.

Answer:

$$f(1.5) = 21;$$

$$f'(1.5) = 28.5;$$

$$f''(1.5) = 28;$$

$$f'''(1.5) = 12.$$