

Week 1 Tutorial Attempt

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1 Question 1

If $f(x) = 2x^3 - x$, find $f(-1)$, $f(0)$, $f(x^2)$, $f(\sqrt{x})$, $f(\frac{1}{x})$

Answer:

Just substitute the numbers accordingly

$$\begin{aligned} f(-1) &= 2(-1)^3 - (-1) \\ &= 2(-1) + 1 \\ &= -2 + 1 \\ &= -1 \quad \blacksquare \end{aligned}$$

$$\begin{aligned} f(0) &= 2(0)^3 - (0) \\ &= 2(0) \\ &= 0 \quad \blacksquare \end{aligned}$$

$$\begin{aligned}
f(x^2) &= 2(x^2)^3 - (x^2) \\
&= 2(x^6) - x^2 \\
&= 2x^6 - x^2 \\
&= x^2(2x^4 - 1) \quad \blacksquare
\end{aligned}$$

$$\begin{aligned}
f(\sqrt{x}) &= 2(\sqrt{x})^3 - (\sqrt{x}) \\
&= 2(x^{\frac{3}{2}}) - \sqrt{x} \\
&= 2x^{\frac{3}{2}} - x^{\frac{1}{2}} \\
&= x^{\frac{1}{2}}(2x - 1) \quad \blacksquare
\end{aligned}$$

$$\begin{aligned}
f\left(\frac{1}{x}\right) &= 2\left(\frac{1}{x^3}\right) - \left(\frac{1}{x}\right) \\
&= 2\left(\frac{1}{x^3}\right) - \frac{1}{x} \\
&= \frac{2}{x^3} - \frac{1}{x} \\
&= \frac{1}{x}\left(\frac{2}{x^2} - 1\right) \quad \blacksquare
\end{aligned}$$

2 Question 2

If $f(x) = \begin{cases} x^2 + 1, & \text{if } x \leq 0 \\ \sqrt{x}, & \text{if } x > 0 \end{cases}$, find $f(-2)$, $f(0)$ and $f(1)$

Answer:

Same as Q1, proper substitution needs to be performed here.

$$\begin{aligned} f(-2) &= 2(-2)^2 + 1 \quad x < 0 \text{ hence take 1st option} \\ &= 2(4) + 1 \\ &= 7 \quad \blacksquare \end{aligned}$$

$$\begin{aligned} f(0) &= 2(0)^2 + 1 \quad x = 0 \text{ hence take 1st option} \\ &= 1 \quad \blacksquare \end{aligned}$$

$$\begin{aligned} f(1) &= 2(1)^2 + 1 \quad x > 0 \text{ hence take 2nd option} \\ &= 2(1) + 1 \\ &= 3 \quad \blacksquare \end{aligned}$$