

key

IB Math 2: Mixed Review (Power rule, Chain rule, Product rule and Quotient rule)

Find the derivative of each function and simplify.

1. $f(x) = x^3 + x^2\sqrt{x} + 2.8 = x^3 + x^{\frac{5}{2}} + 2.8$

$f'(x) = 3x^2 + \frac{5}{2}x^{\frac{3}{2}}$

#1
 $f'(x) = 3x^2 + \frac{5}{2}x^{\frac{3}{2}}$

OR $\Rightarrow 3x^2 + \frac{5}{2}x\sqrt{x}$

2. $f(x) = 7\sqrt{x} + \frac{2}{x^5} = 7x^{\frac{1}{2}} + 2x^{-5}$

#2
 $f'(x) = \frac{7}{2}x^{-\frac{1}{2}} - 10x^{-6}$

$= \frac{7}{2\sqrt{x}} - \frac{10}{x^6}$

3. $f(x) = \frac{8x^8 - 6x^2}{\sqrt{x}} = 8x^{\frac{15}{2}} - 6x^{\frac{3}{2}}$

#3
 $f'(x) = 60x^{\frac{13}{2}} - 9x^{\frac{1}{2}}$

$= 60x^6\sqrt{x} - 9\sqrt{x}$

$f'(x) = (8)(\frac{15}{2})x^{\frac{13}{2}} - (6)(\frac{3}{2})x^{\frac{1}{2}}$

4. $f(x) = (x\sqrt{x})(5x^2 - 1) = x^{\frac{3}{2}}(5x^2 - 1)$

$f'(x) = \frac{3}{2}x^{\frac{1}{2}}(5x^2 - 1) + 10x^{\frac{5}{2}}$

$= \frac{15}{2}x^{\frac{5}{2}} - \frac{3}{2}x^{\frac{1}{2}} + 10x^{\frac{5}{2}}$

#4. $= \frac{35}{2}x^{\frac{5}{2}} - \frac{3}{2}x^{\frac{1}{2}}$

OR $\Rightarrow \frac{35}{2}x^2\sqrt{x} - \frac{3}{2}\sqrt{x}$

$f'(x) = (x^{\frac{3}{2}})'(5x^2 - 1) + (x^{\frac{3}{2}})(5x^2 - 1)'$
 $= \frac{3}{2}x^{\frac{1}{2}}(5x^2 - 1) + x^{\frac{3}{2}}(10x)$

5. $f(x) = (2x - 5)^3(5x^2 - 1)^4$

$f'(x) = (2x - 5)^3(5x^2 - 1)^4 + (2x - 5)^3(5x^2 - 1)^4'$

$= 3(2x - 5)^2(2)(5x^2 - 1)^4 + (2x - 5)^3(4)(5x^2 - 1)^3(10x)$

#5. $= 6(2x - 5)^2(5x^2 - 1)^4 + 40x(2x - 5)^3(5x^2 - 1)^3$

6. $f(x) = \frac{4x - 2}{9x^2 + 2x - 1}$ at $x = 1$

$f'(x) = \frac{4(9x^2 + 2x - 1) - (4x - 2)(18x + 2)}{(9x^2 + 2x - 1)^2}$

#6

$f'(1) = \frac{4(9 + 2 - 1) - (4 - 2)(18 + 2)}{1} = 0$