

Sketch each of the following graphs:-

- 1)  $f(x) = (x^2 - 1)^{\frac{2}{3}}$ ,  $f'(x) = \frac{4}{3\sqrt[3]{(x^2 - 1)}}x$ ,  $f''(x) = \frac{4}{9} \frac{x^2 - 3}{(\sqrt[3]{(x^2 - 1)})^4}$
- 2)  $f(x) = \frac{1}{x - x^2}$ ,  $f'(x) = \frac{2x - 1}{x^2(x - 1)^2}$ ,  $f''(x) = -2 \frac{3x^2 - 3x + 1}{x^3(x - 1)^3}$
- 3)  $f(x) = \frac{8(x - 2)}{x^2}$ ,  $f'(x) = -8 \frac{x - 4}{x^3}$ ,  $f''(x) = 16 \frac{x - 6}{x^4}$
- 4)  $f(x) = \frac{3x}{(x + 2)^2}$ ,  $f'(x) = -3 \frac{x - 2}{(x + 2)^3}$ ,  $f''(x) = 6 \frac{x - 4}{(x + 2)^4}$
- 5)  $f(x) = \frac{-4x}{1 + x^2}$ ,  $f'(x) = 4 \frac{x^2 - 1}{(1 + x^2)^2}$ ,  $f''(x) = \frac{8x(3 - x^2)}{(1 + x^2)^3}$
- 6)  $f(x) = \frac{2x}{\sqrt{x^2 + 1}}$ ,  $f'(x) = \frac{2}{(\sqrt{(1 + x^2)})^3}$ ,  $f''(x) = \frac{-6x}{(\sqrt{(1 + x^2)})^5}$
- 7)  $f(x) = \frac{2x}{\sqrt{x^2 - 1}}$ ,  $f'(x) = -\frac{2}{(\sqrt{(x^2 - 1)})^3}$ ,  $f''(x) = \frac{6x}{(\sqrt{(x^2 - 1)})^5}$
- 8)  $f(x) = \frac{3x^2}{|x|(x - 1)}$ ,  $f'(x) = -3 \frac{x}{|x|(x - 1)^2}$ ,  $f''(x) = 6 \frac{x}{|x|(x - 1)^3}$
- 9)  $f(x) = \frac{2x^2}{9 - x^2}$ ,  $f'(x) = 36 \frac{x}{(-9 + x^2)^2}$ ,  $f''(x) = -108 \frac{3 + x^2}{(-9 + x^2)^3}$
- 10)  $f(x) = \frac{3x^2 - 4x - 4}{x^2}$ ,  $f'(x) = 4 \frac{x + 2}{x^3}$ ,  $f''(x) = -8 \frac{3 + x}{x^4}$
- 11)  $f(x) = \frac{1}{x^2 - 1} + 2$ ,  $f'(x) = \frac{-2x}{(x^2 - 1)^2}$ ,  $f''(x) = 2 \frac{3x^2 + 1}{(x^2 - 1)^3}$
- 12)  $f(x) = \frac{8}{x^2 - 4}$ ,  $f'(x) = -\frac{16x}{(x^2 - 4)^2}$ ,  $f''(x) = 16 \frac{3x^2 + 4}{(x^2 - 4)^3}$
- 13)  $f(x) = \left(\frac{x - 1}{x}\right)^2$ ,  $f'(x) = 2 \frac{x - 1}{x^3}$ ,  $f''(x) = -2 \frac{2x - 3}{x^4}$
- 14)  $f(x) = 2 - \frac{4}{x} + \frac{6}{x^2}$ ,  $f'(x) = 4 \frac{x - 3}{x^3}$ ,  $f''(x) = -4 \frac{2x - 9}{x^4}$
- 15)  $f(x) = \frac{x^2 - 4}{x^2 - 1}$ ,  $f'(x) = \frac{6x}{(x^2 - 1)^2}$ ,  $f''(x) = -6 \frac{3x^2 + 1}{(x^2 - 1)^3}$
- 16)  $f(x) = \frac{3 - x}{2 + x}$ ,  $f'(x) = -\frac{5}{(x + 2)^2}$ ,  $f''(x) = \frac{10}{(x + 2)^3}$
- 17)  $f(x) = \frac{x - 2}{\sqrt{1 - x}}$ ,  $f'(x) = \frac{-x}{2\sqrt{(1 - x)^3}}$ ,  $f''(x) = \frac{1}{4} \frac{x + 2}{(\sqrt{(1 - x)})^5}$

