MATH 12002
Assignment #27
Derivatives

The following are the derivatives for the problems in Assignment #27 on §3.4. You *are* expected to compute the derivatives yourself on the homework, but these can be used to check your answers before graphing.

4. $f(x) = 8x^2 - x^4 = x^2(2\sqrt{2} - x)(2\sqrt{2} + x)$

   $f'(x) = 16x - 4x^3 = 4x(2 - x)(2 + x)$

   $f''(x) = 16 - 12x^2 = 12\left(\frac{2}{\sqrt{3}} - x\right)\left(\frac{2}{\sqrt{3}} + x\right)$

10. $f(x) = \dfrac{x}{(x-1)^2}$

    $f'(x) = -\dfrac{x+1}{(x-1)^3}$

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

11. $f(x) = \dfrac{1}{x^2-9} = \dfrac{1}{(x-3)(x+3)}$

    $f'(x) = -\dfrac{2x}{(x^2-9)^2} = -\dfrac{2x}{(x-3)^2(x+3)^2}$

    $f''(x) = \dfrac{6x^2+18}{(x^2-9)^3} = \dfrac{6x^2+18}{(x-3)^3(x+3)^3}$

13. $f(x) = \dfrac{x}{x^2+9}$

    $f'(x) = \dfrac{9-x^2}{(x^2+9)^2} = \dfrac{(3-x)(3+x)}{(x^2+9)^2}$

    $f''(x) = \dfrac{2x(x^2-27)}{(x^2+9)^3} = \dfrac{2x(x-3\sqrt{3})(x+3\sqrt{3})}{(x^2+9)^3}$

16. $f(x) = \dfrac{x^3-1}{x^3+1}$

    $f'(x) = \dfrac{6x^2}{(x^3+1)^2}$

    $f''(x) = -\dfrac{24x(x^3-\frac{1}{2})}{(x^3+1)^3}$

23. $f(x) = x - 3x^{1/3} = x^{1/3}(x^{2/3} - 3) = \sqrt[3]{x}(\sqrt[3]{x} - \sqrt{3})(\sqrt[3]{x} + \sqrt{3})$

    $f'(x) = \dfrac{x^{2/3}-1}{x^{2/3}} = \dfrac{(\sqrt[3]{x})^2-1}{(\sqrt[3]{x})^2} = \dfrac{(\sqrt[3]{x}-1)(\sqrt[3]{x}+1)}{(\sqrt[3]{x})^2}$

    $f''(x) = \dfrac{2}{3\sqrt[3]{x^5}}$