Practice Sheet # 5

Maxima and minima

1. Find (a) the open intervals on which f is increasing , (b) the open intervals on which f is decreasing, (c) the open intervals on which f is concave up, (d)) the open intervals on which f is concave down and (e) the x- coordinate of all inflection points.

   $(i)\ f(x)=x^2-5x+6 \qquad (ii)\ f(x)=5+12x-x^3$

   $(iii)\ f(x)=x^4-8x^2+16 \qquad (iv)\ f(x)=\dfrac{x^2}{x^2+2} \qquad (v)\ f(x)=\sqrt[3]{x+2}.$

2. Locate the critical numbers and identify which critical numbers correspond to stationary points.

   $(i)\ f(x)=x^3+3x^2-9x+1 \quad (ii)\ f(x)=x^4-6x^2-3$

   $(iii)\ f(x)=\dfrac{x}{x^2+2} \qquad (iv)\ f(x)=x^{2/3}$

   $(v)\ f(x)=x^{1/3}(x+4) \qquad (vi)\ f(x)=\cos 3x.$

3. Find the relative extrema (maxima/ minima) using both the first and second derivative tests.

   $(i)\ f(x)=2x^3-9x^2+12x \qquad (ii)\ f(x)=\dfrac{x}{2}-\sin x,\quad 0<x<2\pi.$

4. Use the given derivative to find all critical numbers of f and determine whether a relative maximum, relative minimum, or neither occurs there.

   $(i)\ f'(x)=x^3(x^2-5) \qquad (ii)\ f'(x)=\dfrac{x^2-1}{x^2+1}.$