1. At time $t = 0$, an object starts from position $s = 0$ moving to the right at 1 m/sec. The velocity changes as shown in the graph below. This graph shows the velocity $v$ (in m/sec) with which the object is moving to the right as a function of time $t$ (in sec). Mark the intervals in the Graph below:

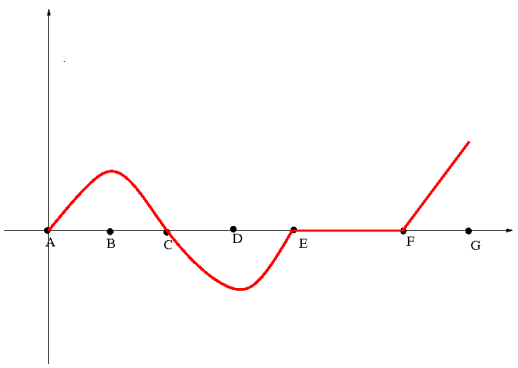
   (a) the object is moving rightward;

   (b) the object is moving leftward;

   (c) the object has positive (rightward) acceleration;

   (d) the object has zero acceleration;

   (e) the object's speed heading to the right is a maximum.




2. Let $f : \mathbb{R} \to \mathbb{R}$ be given by $f(x) = 3x^5 - 10x^3$. Find the

   (a) Zeros of $f$.

   (b) Critical points and characterise them as local maxima, local minima and inflection points.

   (c) interval where $f$ is increasing.

   (d) interval where $f'$ increasing.

   (e) interval where the graph is concave down.

   (f) rough-sketch of graph of $f$

3. Consider the function $f(x) = \frac{x+1}{(x-1)(x-7)}$

   (a) Find the domain of the function $f$.

   (b) In the domain of the function find the first derivative of $f$ .

   (c) Use the above to make conclusions about the behaviour of the function in its domain and draw a rough sketch of the graph of $f(x)$ on plain paper.

4. *Extra Credit:* Nafiza Orange Juice Company packages their frozen orange juice in cylindrical cans. Because of an increase in the cost of the lids of the cans, they plan to change the dimensions of their cans *without changing the volume of the cans.* Their old cans have a volume of $7\pi$ in$^3$. (The formula for the volume of a cylinder is $\pi r^2 h$, where $r$ is the radius of the base of the cylinder, and $h$ is the height of the cylinder.) If they reduce the radius $r$ of the base by 2%, approximately what percent change in the height $h$ will make the new cans have the same volume of $7\pi$ in$^3$ as the old cans? (Use the tangent line approximation)