Worksheet #22A: Derivatives & Graphs I

Basic Guidelines: Intervals on which $f(x)$ is Increasing, Decreasing, Concave Up or Concave Down.

* To find the open intervals where a function is increasing ($f'(x) > 0$) or decreasing ($f'(x) < 0$):
  Take the first derivative, find the critical points and then make a sign analysis.
* To find the open intervals where a function is concave up ($f''(x) > 0$) or concave down ($f''(x) < 0$):
  Take the second derivative and make a sign analysis.
* To find the *x*-coordinates of all inflection points: *Look for a change of concavity where $f''(x)$ changes sign.*

Note: The function will be increasing or decreasing on a closed interval if it is continuous on that interval.

1. Fill in the chart with $+$ or $-$ signs as appropriate

				
f'				
f''				

2. Given $f(x) = x^3 - 12x$, find the following:

a) the critical points of $f(x)$:

b) a sign analysis of $f'(x)$ or sign line or table:

c) the closed intervals (if possible to include the critical point) on which $f(x)$ is increasing or decreasing:

d) a sign analysis of $f''(x)$ or sign line or table:

e) the open intervals on which $f(x)$ is concave up or concave down:

f) the *x*-coordinate of any inflection points:

g) a sketch with critical points and inflection points labeled: