1. The following is the complete graph of some function $s'(x)$ (this is *not* the graph of $s(x)$ which is not shown).

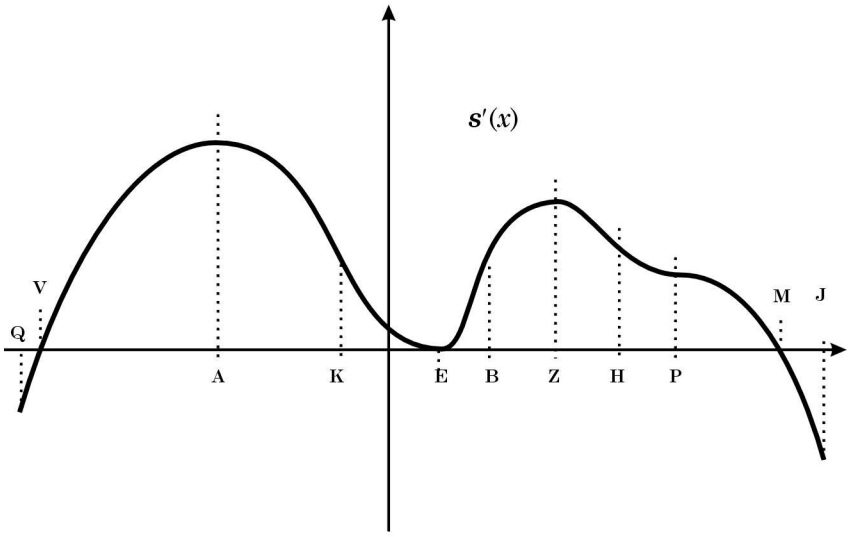
Answer the following questions about $s(x)$, $s'(x)$ and $s''(x)$. Write any intervals in the form "(a, b)"; use "$\cup$" if necessary.

List all x-coordinates at which:

(a) s has a stationary point.
(b) s' has a stationary point.
(c) s has a local maximum point.
(d) s' has a local maximum point.
(e) s has an inflection point.
(f) s' has an inflection point.
(g) s has a global minimum point.
(h) s' has a global mimimum point.

List all intervals on which:

(i) s is an increasing function.
(j) s' is a decreasing function.
(k) s is concave up.
(l) s' is concave down



2A. Suppose $f(x)$ is a function. What is the *definition* of the derivative $f'(a)$?

2B. Use the *definition* to find $f'(a)$ if $f(x) = x^4 + 5x^2 + 99$. Hint: $(D + W)^4 = D^4 + 4D^3W + 6D^2W^2 + 4DW^3 + W^4$.

2C. Find $f'(a)$ using the "power" and other rules for finding derivatives.

3. Let $k(x) = \dfrac{4x - 100}{\sqrt{x^3} - \sqrt{x} - 5x + 5}$.

3a. To see that you've entered this into your calculator correctly, verify that $k(100) = 0.60606060\ldots$

3b. Make three tables in the style of those we've done in class to investigate the following limits:

The first table is to find $\lim_{x\to 1^+} k(x)$ the second to is find $\lim_{x\to 9^+} k(x)$ and the third to is find $\lim_{x\to 25^-} k(x)$.

If any limit is a repeating decimal, eg 5.3333..., write it as a fraction (here that would be 5 1/3). Each table should have at least FOUR useful values of x. Use correct notation in your tables and in your answers.

YOUR RESULTS:

$\lim_{x\to 1^+} k(x)$ [ ] $\lim_{x\to 9^+} k(x)$ [ ] $\lim_{x\to 25^-} k(x)$ [ ]

3c. Based on your experience, what would you *expect* the following limits to be? (No tables required).

$\lim_{x\to 1^-} k(x)$ [ ] $\lim_{x\to 9^-} k(x)$ [ ] $\lim_{x\to 25^+} k(x)$ [ ]

3d. Assuming that the appropriate limit results above are correct, in terms of our definition of continuity (it involves limits), is $k(x)$ continuous at $a = 9$? *Explain your answer!*

3e. In terms of our definition of continuity (it involves limits), is $k(x)$ continuous at $a = 25$? *Explain your answer!*

4. Let $G(x) = x^3 - 6x^2 + 7x + 8$.

4A. Make a table to find the average rate of change in $G(x)$ over intervals of the form $[1, 1+h]$ for $h = 0.5$, 0.0005, and 0.000005.

Your table should have three columns as done in class: h in the first column, the corresponding interval in the second column, and the average rate of change for that interval in the third column.

4B. As $h \to 0^+$, does the table suggest a limit to these average rates of change? What does $G'(1)$ appear to be? (You do *not* have to make a table for $h \to 0^-$).

4C. Using derivative "rules", what is the general formula for $G'(x)$?

4D. What is $G'(1)$?

4E. Find the equation of the line tangent to the graph of G at $(1, G(1))$.

4F. Find the anti-derivative $J(x)$ of $G(x)$ which satisfies $J(0) = 12$.

5. Consider the graphs of the three functions H, G, and P, just below. Below those three are the graphs of nine functions, each labeled with a capital letter. From those nine functions, determine which is the best choice for each of the following questions 5A–5F, and write the appropriate capital letter next to the question. NOTE that some of those nine graphs may be used more than once, others not at all.

5A) The *derivative of* $H(x)$:

5B) An *anti-derivative* of $H(x)$:

5C) The *derivative of* $G(x)$:

5D) An *anti-derivative* of $G(x)$:

5E) The *derivative of* $P(x)$:

5F) An *anti-derivative* of $P(x)$: