**WORKSHEET VII**

**Shortcuts**

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I Using the short cuts of differentiation *when appropriate*, compute the derivative of each of the following functions.

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II (A) Find the equations of the *tangent* and *normal lines* to the curve

y = (x – 4)/(x + 1) at x = 3.

(B) Find the equations of the *tangent* and *normal* lines to the curve

y = sin x at x = /4.

III (A) Using appropriate shortcuts, find formulas for the derivatives of

y = tan x and y = sec x.

(B) Using appropriate shortcuts, find formulas for the derivatives of

y = sinh x, y = cosh x and y = tanh x.

IV  Charlotte, the spider, dances along the x-axis according to the rule

x(t) = t3 – 3t + 5. (Here time is measured in *seconds* and distance in *cm*.)

1. Find Charlotte’s velocity at time t = 2 sec.
2. Find Charlotte’s acceleration at time t = 2 sec.

V Sketch the curve y = x2(x – 2)2. Over which interval(s) is the graph *rising?* *falling?* Locate any local maxima or minima.

VI Sketch the curve y = (x2 + 1)/ (x2 + 3). Over which interval(s) is the graph rising? falling? Locate any local maxima or minima.

VII Sketch the curve y = xex. Over which interval(s) is the graph rising? falling? Locate any local maxima or minima.

VIII Sketch the curve y = (x – 3)/ (x2 + 1). Over which interval(s) is the graph rising? falling? Locate any local maxima or minima.

IX Consider the curve *y = b + c sin x*. For each of the following values of *b* and *c*, determine when the graph is rising and when it is falling:

1. b = 3, c = 1
2. b = c = 1
3. b = 1, c = 2

X Sketch the curve y = 1/x + x2 over the interval (0, ∞). Over which interval(s) is the graph rising? falling? Locate any local maxima or minima.

*What Romantic terminology called genius or talent or inspiration is nothing other than finding the right road empirically, following one’s nose, taking shortcuts.*

* Italo Calvino (1923 – 1985)

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