Some Stuff You Should Know for Calculus

Math 120, Fall 2003

- Do the following problems **by hand**

  1. Factor the polynomials $x^2 - x - 6$ and $x^3 + 4x^2 + 3x$.
  2. Simplify the following expressions as much as possible:
     (a) x^2x^3
     (b) $(x^2)^3$
     (c) $\frac{x^7}{x^{-3}}$
     (d) $\frac{x^2+2x+1}{x^2+4x+3}$
     (e) $\frac{x^2+5}{x}$
  3. Let $f(x) = 3x^2 - 7$. Evaluate f at the following values of x:
     (a) $x = 2$
     (b) $x = 2 + h$
     (c) $x = s^3 + 5$
  4. Find the point of intersection of the lines $y = 3x - 6$ and $y + 4x - 1 = 0$.

- Do the following problems **with your calculator.** In each case compare your answers to the ones you obtained by hand.

  1. Factor the polynomials $x^2 - x - 6$ and $x^3 + 4x^2 + 3x$ using the `factor(` command.
  2. Simplify x^2x^3, $(x^2)^3$, $\frac{x^7}{x^{-3}}$, $\frac{x^2+2x+1}{x^2+4x+3}$, and $\frac{x^2+5}{x}$ Type in each of the expressions and compare your calculator output to your answers to question 2 above. You will need to use either the `factor(` command or the `expand(` command, both under the `Algebra` menu.
  3. Evaluate the function $f(x) = 3x^2 - 7$ first at $x = 2$, then at $x = 2 + h$, then at $x = s^3 + 5$. You can do this several ways.
     (a) In your "`Y=`" menu, enter $3x^2 - 7$ in your `y1`. Now in the home screen, type `y1(2)` to get the function evaluated at 2. Then type `y1(`$2 + h$`)` and `y1(`$3x^2 - 7$`)`.
     (b) On your home screen, enter $3x^2 - 7$ `STO`$\rightarrow f(x)$ (you have to type in the $f(x)$ part). Now you can type $f(2)$, $f(2 + h)$, or $f(s^3 + 5)$ to evaluate the function. Expand your latter answers if necessary.
     (c) On your home screen, enter $3x^2 - 7|x = 2$. Repeat for the other values.
  4. Find the point of intersection of the lines $y = 3x - 6$ and $y + 4x - 1 = 0$. You can do this two ways.
     (a) Solve for y in both cases, enter the two lines in your `Y=` editor, graph the lines, then go to `Intersection` under the F5 menu of the grapher.

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(b) Solve for y in both cases, set the two equations equal to each other, then use the solver to find the point of intersection (`solve(3x-6=-4x+1,x)`).

- More graphing on your calculator
  1. Make sure your calculator is in "radian" mode (Press `MODE` key and set `ANGLE` to `radian`. Then enter `y1` $=\sin(x)$ in your `Y=` editor.
  2. Change your window so that `xmin` $= -50$, `xmax` $= 50$, `ymin` $= -50$, and `ymax` $=$ `50` (it does not matter what the steps and resolution are).
  3. Graph your function in the given window. You should not be able to see much of anything.
  4. Get something interesting by hitting `ZoomFit`. The graph should be somewhat recognizable now.
  5. Now do whatever you can to get a nice, smooth picture of $\sin(x)$ with only two peaks and two valleys. Zooming probably won't work, so you'll have to change the window.
  6. Use the trace function to find the y-coordinate when $x = 2$.
  7. With your cursor still on the graph at $x = 2$, use the zoom in key to zoom in on the function until the graph looks like a straight line at $x = 2$. What is the slope of the line that you see?
  8. Set up a table of values of $\sin(x)$ so that the start value is 0 and the step value (Δ `tbl`) is 1. Using your table, determine how many sign changes (from + to −, or from − to +) $\sin(x)$ makes between 0 and 20.

- A few more things
  1. Are the following expressions true or false?
     (a) $x^2y^2 = (xy)^2$
     (b) $x^2y^2 = (xy)^4$
     (c) $\sqrt{x}\sqrt{y} = \sqrt{xy}$
     (d) $\sqrt{x} + \sqrt{y} = \sqrt{x+y}$
     (e) $x^{-1} = \frac{1}{x}$
     (f) $x^{1/2} = \frac{1}{x^2}$
  2. Write the equations of the following lines.
     (a) The line with slope -2 passing through the point (5,2).
     (b) The line passing through the points (1,-3) and (5,2).
     (c) The line parallel to $y = 3x + 5$ with y-intercept at 7.
     (d) The line parallel to $y = 3x + 5$ with x-intercept at 2.
  3. Find the distance between the points (-2,3) and (4,8).
  4. Match the interval in the first row with the equivalent statement using inequalities in the second row.

a) $(-2, 3]$	*b*) $(-2, 3)$	*c*) $[-2, 3]$	*d*) $[-2, 3)$
i) $-2 \le x \le 3$	*ii*) $-2 \le x < 3$	*iii*) $-2 < x \le 3$	*iv*) $-2 < x < 3$

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