**EML 5060** **Analysis in Mechanical Engineering** **Fall 2018**
*Test 1* *Van Dommelen (http://ww2.eng.famu.fsu.edu/~dommelen)* *Due F 8/31/18*

Hand in the solution to this test on the date stated above (5% of your final grade). *Read carefully. And look it up. Answer questions in order from left to right, top to bottom.* You must work alone. You probably want to consult a math handbook.

Neatly draw the graph of the following functions, showing the locations of 0 and ±1 on each axis. Give the derivative. Indicate non-principal values as a broken line. Make sure that you give enough of the curves to *clearly* demonstrate *all* features (like periodicity, asymptotic behavior, multiple valuedness, etcetera). *Make sure that you have answered all parts, including derivatives.*

1) $x-2$ 2) $x^2-4$ 3) $x^3-x$

4) $\sin(x)$ 5) $\arcsin(x)$ 6) $\sinh(x)$

7) $\cos(x)$ 8) $\arccos(x)$ 9) $\cosh(x)$

10) $\tan(x)$ 11) $\arctan(x)$ 12) $\tanh(x)$

13) $\ln(x)$ 14) $e^x$ 15) $\sin(\pi x^2)$

Find (include any integration constants and absolute signs):

16) $\displaystyle\int x^{-2}\mathrm{d}x =$ 17) $\displaystyle\int_1^2 x^{-2}\mathrm{d}x =$ 18) $\displaystyle\int_1^x \xi^{-2}\mathrm{d}\xi =$

19) $\displaystyle\int \frac{\mathrm{d}x}{x} =$ 20) $\displaystyle\int \frac{1}{1-x^2}\mathrm{d}x =$ 21) $\displaystyle\int \frac{1}{1+x^2}\mathrm{d}x =$

22) $\displaystyle\int \ln(x)\mathrm{d}x =$ 23) $\displaystyle\int xe^x\mathrm{d}x =$ 24) $\displaystyle\int xe^{x^2}\mathrm{d}x =$

25) $\begin{vmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 1 \end{vmatrix} =$ 26) $\displaystyle\lim_{x\to 0}\frac{\sin(x)}{x} =$ 27) $\displaystyle\frac{\mathrm{d}}{\mathrm{d}x}\int_0^x \frac{\sin(x\xi)}{\xi}\mathrm{d}\xi =$

28) $1+2+3+4\ldots+1000 =$ 29) $x+x^2+x^3+x^4+\ldots =$

30) Solve : $\displaystyle\frac{\mathrm{d}y}{\mathrm{d}x} = -y \qquad y(0)=1$