1. Find Taylor/Maclaurin Series expansion for the following functions about the given point using the definition of Taylor series. (You may find your work on the previous worksheet helpful on some of these.)

   (a) $f(x) = e^x$ about $x = 1$

   (b) $f(x) = \sqrt{x+1}$ about $x = 0$

   (c) $f(x) = \frac{1}{1+x}$ about $x = 0$

   (d) $f(x) = \ln(x)$ about $x = 2$

   (e) $f(x) = \ln(x+1)$ about $x = 0$

   (f) $f(x) = \sin(x)$ about $x = \pi/2$

   (g) $f(x) = \cos(x)$ about $x = \pi/2$

2. Write down the Maclaurin series expansion for the following. (You should memorize these!) What is the interval of convergence for each of these?

   (a) $f(x) = \frac{1}{1-x}$ (b) $f(x) = \sin(x)$ (c) $f(x) = \cos(x)$ (d) $f(x) = e^x$

3. Using algebra/calculus and known Taylor series, find the Taylor Series expansion for the following functions about the given point.

   (a) $f(x) = \dfrac{x}{1-x}$ about $x = 0$

   (b) $f(x) = \dfrac{x^2}{1-x}$ about $x = 0$

   (c) $h(x) = \dfrac{1}{1-3x}$ centered at $x = 0$

   (d) $f(x) = e^{x^2}$ about $x = 0$

   (e) $f(x) = x\sin(x)$ about $x = 0$

   (f) $f(x) = e^{x-3}$ about $x = 0$

   (g) $f(x) = e^{5x^4}$ about $x = 0$

   (h) $f(x) = x^2\sin(3x)$ about $x = 0$

   (i) $f(x) = e^x$ about $x = 3$ (Hint: Use your answer from 3f.)

   (j) $f(x) = \sin(x)$ about $x = \pi/2$ (Hint: $\sin(x) = \sin((x - \pi/2) + \pi/2)$. Also, recall that $\sin(a + \pi/2) = \cos(a)$.)

   (k) $f(x) = \cos(x)$ about $x = \pi/2$ (Hint: Similar to the previous problem.)