Spring 2015 *Russell Brown*
Calculus I *MA 113:011-015*

1. Compute the derivative of
$$f(x) = (x^3 + 2x)e^x.$$
Using the product rule
$$\begin{aligned} f'(x) &= (x^3+2x)'e^x + (x^3+2x)(e^x)' \\ &= (3x^2+2)e^x + (x^3+2x)e^x \\ &= (x^3+3x^2+2x+2)e^x. \end{aligned}$$

2. Find the equation of the line tangent to the graph of the function
$$f(x) = \frac{2-x}{1+x}$$
at the point $(1, f(1))$.

   (a) Compute the derivative $f'(x)$ and compute $f'(1)$.
   From the quotient rule we have
$$\begin{aligned} f(x) &= \frac{(-1)(1+x)-(2-x)1}{(1+x)^2} \\ &= \frac{-3}{(1+x)^2}. \end{aligned}$$
   Evaluating at $x = 1$ gives that $f'(1) = -3/4$.

   (b) Write out the equation of the tangent line and check by graphing f and the tangent line.
   The tangent line passes through the point $(1, f(1)) = (1, 1/2)$ and the equation is $y - \frac{1}{4} = -\frac{3}{4} \cdot (x-1)$. Simplifying gives the equation
$$y = -\frac{3}{4}x + \frac{5}{4}.$$