Name: _____

Show your work. Answers without work earn reduced credit.

1. [**7 parts, 1 point each**] Differentiate the following functions.

   (a) $(5x^2 + 1)^6$

   (b) $y = \sqrt{s^3 + 1}$

   (c) $f(x) = 4x^2 + \ln(x^2 + 1)$

   (d) $y = x \ln x$

   (e) $y = (x + 4)^6(x - 1)^3$

   (f) $f(x) = (\ln(x) + e^{2x})^5$

   (g) $f(x) = \dfrac{x^3 + 2x}{x^2 + 1}$

2. [**1 point**] Graph a function with two critical points. One of these critical points should be a local maximum, and the other should be neither a local maximum nor a local minimum.

3. [**2 parts, 1 point each**] Let $f(x) = x^2(x-5)^3$.

   (a) Find the critical points of $f(x)$.

   (b) Use the First Derivative Test (i.e. sign chart) to classify the critical points. *Hint:* one of the critical points is neither a local minimum nor a local maximum.