1. (a) $\dfrac{d}{dx}\left[\pi x^e e^x \sqrt{x}\right]$

   (b) $\dfrac{d}{dx}\left[\dfrac{\left(\frac{e^x}{x^{300}+x}\right)}{\sin x \cos x}\right]$ *Hint:* $\frac{d}{dx}\cos x = -\sin x$.

   (c) Find all tangent lines to $f(x) = x^2 + 2x + 1$ which go through the origin.

2. Matt is grinding a rail on his skateboard with position $p(t) = \frac{1}{3}t^3 + \frac{1}{2}t^2 - 4t + 10$.

   (a) Find all times when Matt is grinding right (positive direction).

   (b) Find all times when Matt is grinding left (negative direction).

   (c) Use this to figure out Matt's leftmost position for $t \geq 0$.

3. (a) Let $g(x) = x|x|$. Is $g(x)$ differentiable at $x = 0$? If so find $g'(0)$. If not explain why.

   (b) Let $h(x) = \begin{cases} a^2x^3 + \frac{1}{bx}, & x > 1 \\ a(x-1)e^x, & x \leq 1 \end{cases}$. Find a and b so h is differentiable at $x = 1$.

   (c) Below is a graph of a function $g(x)$. Draw $g'(x)$.