Please show all your work in order to receive partial credit.

1. Consider the function $f$ graphed below.

   \[ f' \]

   \[ a \quad b \]

   (a) For what values is $f'(x) = 0$?

   $f'(x) = 0$ at $x = a$, $b$, and 0

   (b) On what interval(s) is $f'(x) > 0$?

   $f' > 0$ on $(a, 0)$ and $(0, b)$ since $f$ is increasing on those intervals

   (c) On what interval(s) is $f'(x) < 0$?

   $f' < 0$ on $(-\infty, a)$ and $(b, \infty)$ since $f$ is decreasing on those intervals

   (d) Determine the values of $\lim_{x \to \infty} f(x)$ and $\lim_{x \to -\infty} f(x)$. Use this information to determine the value of the slope of $f$ when $|x|$ is large.

   \[
   \lim_{x \to \infty} f(x) = 0 \quad \text{and} \quad \lim_{x \to -\infty} f(x) = 0.
   \]

   In other words, $f(x)$ has a horizontal asymptote of $y = 0$. Therefore, the slope of $f$ will be close to zero for $|x|$ large, since $f$ looks flat to the far left and right of the graph. In addition, since $f'(x) < 0$ on $(-\infty, a)$ and $(b, \infty)$ it follows that the graph of $g'(x)$ must approach the $x$-axis from below as $x \to \infty$ and as $x \to -\infty$.

   (e) Sketch a graph of $f'$ below.

   \[ f'' \]

   \[ a \quad b \]

   2. Use the power rule to find derivatives for the following functions.

   \[
   \begin{array}{c|c|c}
   (a) f(x) = x^{13} & (b) f(x) = \frac{1}{x^3} = x^{-3} & (c) f(x) = \sqrt[3]{x} = x^{1/3} \\
   f'(x) = 13x^{12} & f'(x) = -3x^{-4} = -\frac{3}{x^4} & f'(x) = \frac{1}{3}x^{-2/3} = \frac{1}{3\sqrt[3]{x^2}}
   \end{array}
   \]