Show all work; unjustified answers may receive less than full credit.

(8 pts.) 1. Graph \( y = x^{2/3}(x - 1) \) without using your calculator (show all work).

\[
\begin{align*}
  y &= x^{5/3} - x^{2/3} \\
  y' &= \frac{5}{3} x^{2/3} - \frac{2}{3} x^{-1/3} = \frac{1}{3} x^{-1/3} (5x - 2) \\
  c_{1,0} &= 0, \frac{2}{5} \\
  y'' &= \frac{10}{9} x^{-1/3} + \frac{2}{9} x^{-5/3} = \frac{2}{9} x^{-5/3} (5x + 1) \\
  \text{infl. pts: } &= 0, -\frac{2}{5} \\
\end{align*}
\]

(4 pts.) 2. Calculate the following limits.

a. \( \lim_{x \to 0} \frac{-1}{x} \) \( \lim_{t \to 0} \frac{e^t - 1}{2t} = \lim_{t \to 0} \frac{e^t}{2} = \frac{1}{2} \)

b. \( \lim_{x \to 0^+} \sqrt{x} \ln(x) \)

\[ \lim_{x \to 0^+} \frac{\ln(x)}{x^{-1/2}} = \lim_{x \to 0^+} \frac{-\frac{1}{x}}{-\frac{1}{2} x^{-3/2}} = \lim_{x \to 0^+} \frac{x^{1/2}}{\frac{1}{2}} = \infty \]

(8 pts.) 3. A store selling gasoline at $2.00 per gallon sells 1000 gallons per day. On Thrifty Thursdays they reduce the price by $1.10 per gallon and sell 1100 gallons that day.

a. Find the demand function assuming it is linear.

b. If the shop’s daily cost function is \( c(x) = 1000 + .6x \), how much should they reduce their price in order to maximize profit?

\( \text{Max profit: } P = \Pi(x) \) \( x = 1200 \)

\[
\begin{align*}
  \Pi'(x) &= (.001x + 3)x - (1000 + .6x) \\
  &= .001x^2 + 2.4x - 1000 \\
  \Pi'(x) &= .002x + 2.4 = 0 \\
  x &= 1200 \\
  \Pi(1200) &= .001(1200)^2 + 3 \\
  &= .001(1200)^2 + 3 \\
  &= 1.80 \\
  \text{Reduce by } &\frac{1.10}{2.20} \text{ per gallon}
\end{align*}
\]