1. Let \( f(x) = 5x^{\frac{2}{3}} - x^{\frac{5}{3}} \)

(a) Find any vertical or horizontal asymptotes of \( f \).

(b) Find all points where \( f(x) = 0 \).

(c) Find intervals of increase or decrease using the First Derivative Test (page 291).

(d) Find the local minimum and maximum values.

(e) Find the intervals of concavity and inflection points.

(f) Use the information from parts (a)-(d) to sketch the graph of \( f \). Clearly draw any vertical and/or horizontal asymptotes in your graph. Label all the points you found in parts (c) and (d) in your graph.
2. Let \( f(x) = x - \frac{1}{6} x^2 - \frac{2}{3} \ln x \)

(a) Find any vertical or horizontal asymptotes of \( f \).
(b) Find intervals of increase or decrease using the First Derivative Test (page 291).
(c) Find the local minimum and maximum values.
(d) Find the intervals of concavity and inflection points.
(e) Use the information from parts (a)-(d) to sketch the graph of \( f \). Clearly draw any vertical and/or horizontal asymptotes in your graph. Label all the points you found in parts (c) and (d) in your graph.
3. Let \( f(x) = e^{\arctan(x)} \). (Note that \( e^{\pi/2} = 4.8 \) and \( e^{-\pi/2} = 0.2 \))

(a) Find any vertical or horizontal asymptotes of \( f \).
(b) Find intervals of increase or decrease using the First Derivative Test (page 291).
(c) Find the local minimum and maximum values.
(d) Find the intervals of concavity and inflection points.
(e) Use the information from parts (a)-(d) to sketch the graph of \( f \). Clearly draw any vertical and/or horizontal asymptotes in your graph. Label all the points you found in parts (c) and (d) in your graph.
4. A rectangular storage container with an open top is required to have a volume of 10 m$^3$. The length of its base is twice the width. Material for the base costs $10 per square meter. Material for the sides costs $6 per square meter. Find the cost of materials for the cheapest such container.

5. You live on a farm and you need to build a pen for your pigs. You are going to build it with one side being your barn, which is 30 meters long. You have 40 meters of fence available. What is the largest pen that you can build for your pigs?