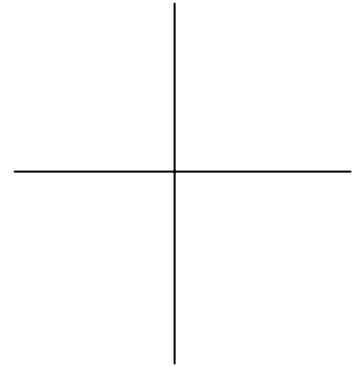POWER FUNCTIONS AND EXPONENTIAL FUNCTIONS

1. Graph $y = \dfrac{1}{x}$ using the window [-5,5] x [-10,10].

   a. As x approaches infinity, y approaches_____.

   b. As x approaches negative infinity, y approaches_____.

   c. As x approaches zero from the left, y approaches_____.

   d. As x approaches zero from the right, y approaches_____.

   e. The equations of the asymptotes are _____.

2. Graph $y = \dfrac{1}{x^2}$ using the window [-5,5] x [-2,10].

   a. As x approaches infinity, y approaches_____.

   b. As x approaches negative infinity, y approaches_____.

   c. As x approaches zero from the left, y approaches_____.

   d. As x approaches zero from the right, y approaches_____.

   e. The equations of the asymptotes are _____.
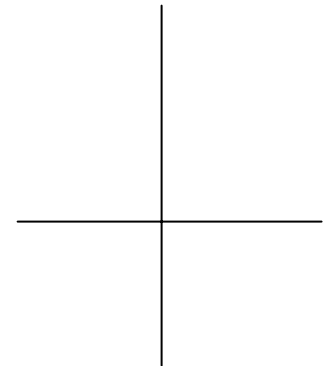
3. Graph $y = x$, $y = \sqrt{x^3}$, and $y = x^2$ together using the window [0,2] x [0,2].

   a. Why should we restrict the domain to $x \geq 0$?

   b. In addition graph $y = \sqrt{x}$ and $y = \sqrt[3]{x}$. What is the relationship of all the graphs for $0 \leq x \leq 1$? For $x > 1$?

   c. Which of the graphs above are concave up? Concave down? Would $y = \sqrt{x^5}$ be concave up or down? Would $y = \sqrt[4]{x}$ be concave up or down?

4. Graph $y = 50x^2$ and $y = x^3$ using the window [-25,25] x [-5000,5000].

   a. Which of these functions seems to dominates the other?

   b. Change the window to [0,50] x [0,25000]. Does your answer to the previous question change?

   c. Change the window to [0,100] x [0,250000]. Does your answer to the previous question change?
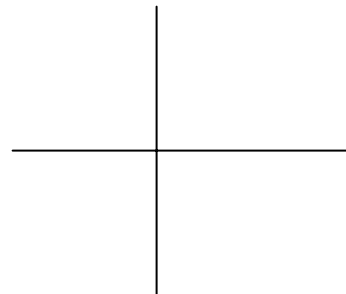
5. Graph $y = 100x^2$ and $y = 0.01x^3$ using the window [-5000,5000] x $[-10^9, 10^9]$.

   a. Which of these functions seems to dominates the other?

   b. Change the window to [-10000,10000] x $[-10^{10}, 2x10^{10}]$. Does your answer to the previous questions change?

   c. True or false. As long as the coefficients are greater than zero, the function with the higher power always dominates.
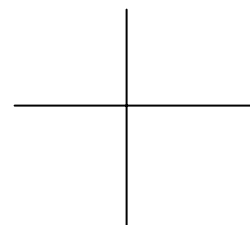
6. Graph $y = x^3$ and $y = 2^x$ using the window [-5,5] x [-10,10].

   a. Which of these functions seems to dominate the other?

   b. Change the window to [-1,10] x [-1,1000]. Does your answer change?

   c. Change the window to [-1,15] x [-1,1000]. What happens?

   d. Change the window to [-1,20] x [-1,10000]. Which function dominates?
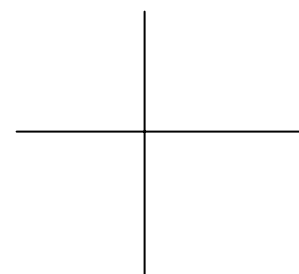
7. Graph $y = 2^{-x}$ and $y = x^{-2}$ using the window [1,7] x [0,0.4].

   a. Are these functions increasing or decreasing?

   b. Which function seems to approach the x-axis faster?

   c. Compare the behaviors of the functions near $x = 0$.