Precalculus Worksheet

Topic: Graphs of Functions

Instructions

Answer the following problems. Use diagrams and show all calculations clearly.

Practice Problems

1. **Sketch the graphs of the following functions and identify their key features:**
   i. $f(x) = x^2 - 4$
   ii. $g(x) = \sqrt{x}$
   iii. $h(x) = |x - 3|$

2. **Transformation of Functions:** Sketch the graph of $f(x) = x^2$ and apply the following transformations. Write the equation of the new function and describe the transformation:
   i. Shifted up by 3 units.
   ii. Reflected across the x-axis.
   iii. Stretched vertically by a factor of 2.
   iv. Shifted right by 4 units.

3. **Piecewise Functions:** Graph the following piecewise function and identify its domain and range:

$$f(x) = \begin{cases} x + 2 & \text{if } x \leq 0, \\ x^2 & \text{if } x > 0. \end{cases}$$

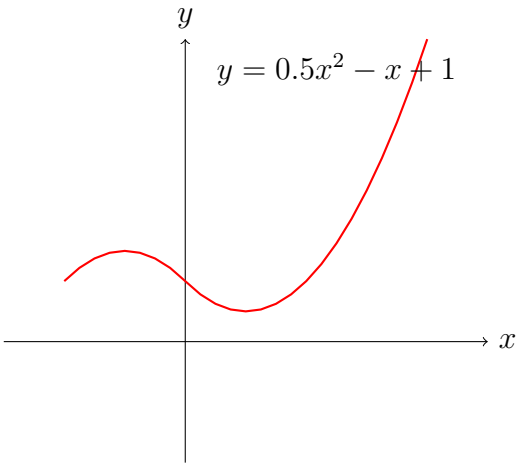
4. **Identify the domain, range, intercepts, and asymptotes (if any) of the following functions:**

   i. $f(x) = \frac{1}{x}$

   ii. $g(x) = \sqrt{x-2}$

   iii. $h(x) = e^x$

5. **Analyze the following graph and answer the questions below:**

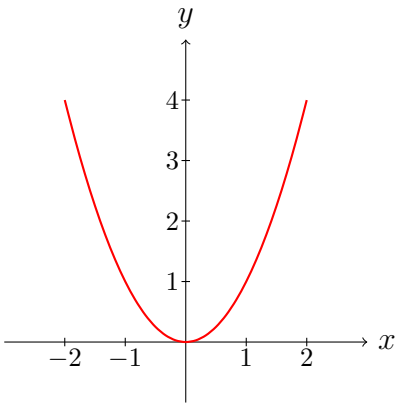


   i. What is the vertex of the graph?

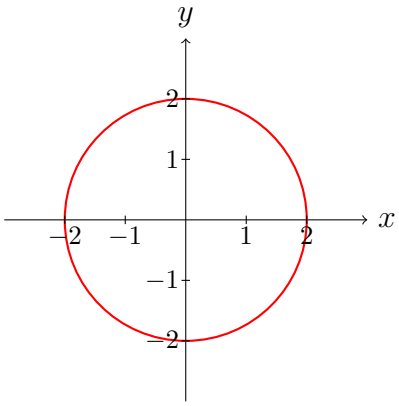
   ii. Identify the axis of symmetry.

   iii. Find the x- and y-intercepts.

6. Use the Vertical Line Test to determine whether the following curves represent graphs of functions of x. If they are functions, state their domain and range.



7.



8. The revenue R of a company (in thousands of dollars) is given by the function $R(x) = -2x^2 + 12x + 20$, where x is the number of items sold (in hundreds). Find:

   i. The number of items sold that maximizes revenue.

   ii. The maximum revenue.

   iii. The revenue when $x = 3$.

9. A ball is thrown from the top of a building. Its height $h(t)$ in meters after t seconds is given by $h(t) = -5t^2 + 20t + 50$. Find:

   i. The maximum height of the ball and when it occurs.

   ii. The height of the ball at $t = 2$ seconds.

   iii. The time it takes for the ball to hit the ground.

Multiple Choice Questions

1. Which of the following functions represents a transformation of $f(x) = x^2$ shifted 2 units up and 3 units left?

   A. $g(x) = (x - 3)^2 + 2$

   B. $g(x) = (x + 3)^2 + 2$

   C. $g(x) = (x + 3)^2 - 2$

   D. $g(x) = (x - 3)^2 - 2$

2. If $f(x) = \frac{1}{x-2}$, which value of x is excluded from the domain?

   A. $x = 0$

   B. $x = 2$

   C. $x = -2$

   D. $x = 1$

3. What is the range of the function $g(x) = |x - 4|$?

   A. $[0, \infty)$

   B. $(-\infty, 0]$

C. $(-\infty, \infty)$

D. $(0, \infty)$

4. Which of the following graphs represents an exponential function?

   A. A straight line.

   B. A parabola.

   C. A curve that increases rapidly.

   D. A curve that oscillates.
