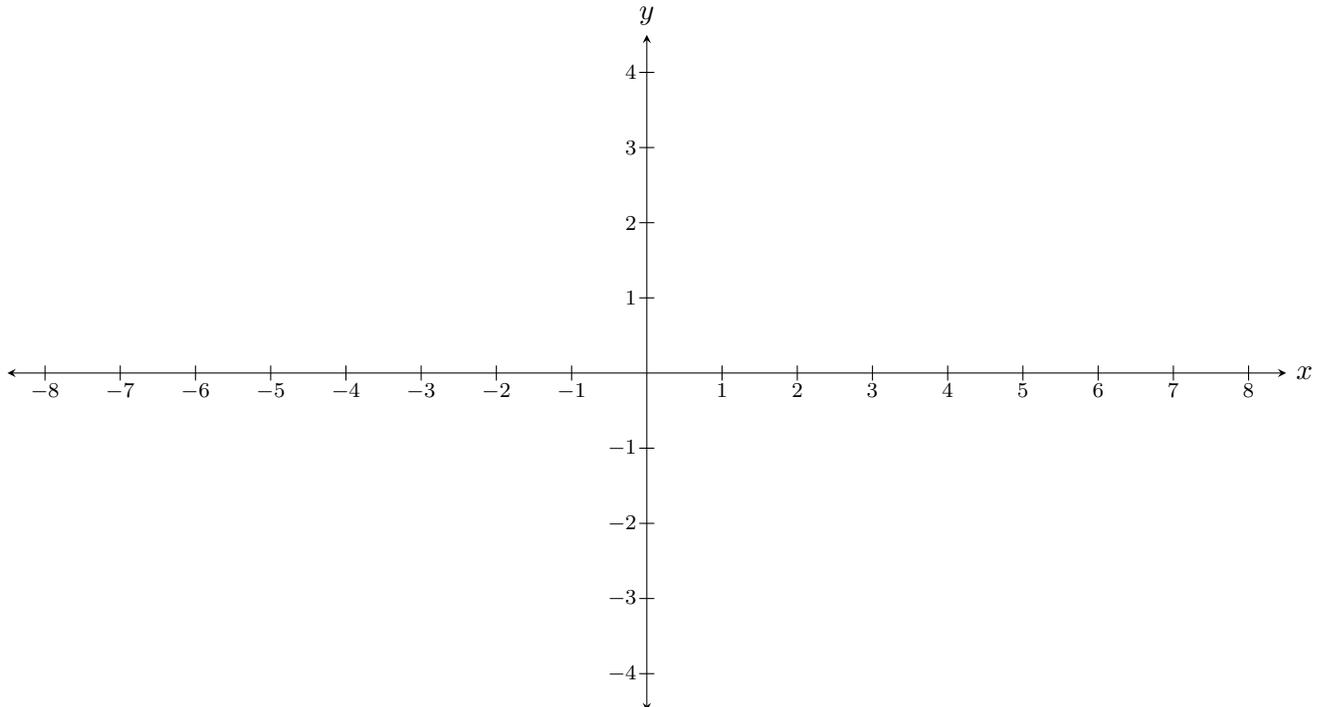1. (10 pts.) This problem concerns the functions $f(x) = \dfrac{\sqrt{x-2}}{3 + \cos(x)}$ and $g(x) = \sqrt{x} - 2$.

   (a) State the domain of $f(x)$.

   (b) $f \circ g(x) =$

2. (10 pts.) Consider the equation $\dfrac{1}{3}\tan^2(x) - 1 = 0$. Find all solutions x that lie in the interval $[0, 2\pi)$.

3. (10 pts.) Sketch the graph of any function $y = f(x)$ that meets the following four criteria: The line $x = 1$ is a vertical asymptote, the line $y = -2$ is a horizontal asymptote, $f(-1) = 2$, and $\lim\limits_{x \to -3} f(x) = 0$.

4. (20 pts.) Answer the following questions about the function $y = f(x)$ graphed below.

(a) $f(1) =$

(b) $f \circ f(2) =$

(c) $\lim\limits_{x \to 0} f(x) =$

(d) $\lim\limits_{x \to 1} f(x) =$

(e) $\lim\limits_{x \to 1^+} f(x) =$

(f) $\lim\limits_{x \to 1^-} f(x) =$

(g) $\lim\limits_{x \to \infty} f(x) =$

(h) $\lim\limits_{x \to -\infty} f(x) =$

(i) State an interval on which $f(x)$ is continuous.

(j) State an x-value at which $f(x)$ is discontinuous.
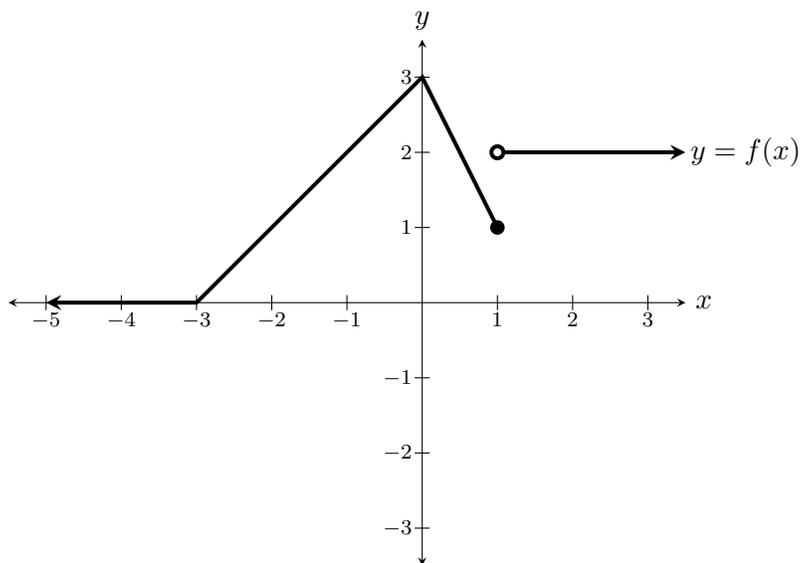
5. (28 pts.) Evaluate the following limits.
   If you want credit, show your steps, explain your reasoning, and carry limits as appropriate.

(a) $\lim\limits_{x \to 2} \dfrac{x^2 - 7x + 10}{x^2 + x - 6} =$

(b) $\lim\limits_{h \to 0} \dfrac{\sqrt{7 - h} - \sqrt{7}}{h} =$

(c) $\lim\limits_{x \to 4^-} \dfrac{(-x + 4)(x + 3)}{|-x + 4|} =$

(d) $\lim\limits_{\theta \to 0} \dfrac{1}{\theta \cot(4\theta)} =$

6. (12 pts.) Find all the horizontal asymptotes and vertical asymptotes of $f(x) = \dfrac{x^2 + x - 6}{x^2 - x - 12}$.

7. (10 pts.) Find the value a such that the following $f(x)$ is continuous at every number x.

$$f(x) = \begin{cases} x^2 + 2 & \text{if } x < 3 \\ ax & \text{if } x \geq 3 \end{cases}$$