1. Which of the following functions is continuous at all points in their domain?

   (a) $a(t)$ is the height of a skydiver $t$ seconds after jumping from a plane.
   (b) $n(t)$ is the number of quarters needed to park in a metered space for $t$ minutes.
   (c) $p(t)$ is the number of points scored by a basketball player $t$ minutes into a basketball game.
   (d) $T(t)$ is the temperature in Chicago $t$ minutes after midnight on January 1, 2012.

2. Find the point(s) (if any) at which each the following functions is discontinuous.

   (a) $f(x) = \frac{x + 2}{x^2 - 7x + 12}$
   (b) $f(x) = \frac{5}{x^2 + x + 1}$
   (c) $f(x) = \frac{\cos x}{e^x + 4}$
   (c) $f(x) = \frac{3x^2 - 2x - 1}{x - 1}$

3. Determine if the following functions are continuous at the given point $a$. Your answer should use the definition of continuity on page 113.

   (a) $f(x) = \begin{cases} 
   \cos x, & \text{if } x < 0 \\
   1, & \text{if } x = 0 \\
   2 - x, & \text{if } x > 0 
   \end{cases}$
   $a = 0$

   (b) $f(x) = \begin{cases} 
   \frac{x^2 - 1}{x - 1}, & \text{if } x \neq 1 \\
   3, & \text{if } x = 1 
   \end{cases}$
   $a = 1$

4. Sketch a graph of a function $f(x)$ which satisfies all of the following properties. **Note:** You should draw **one** function $f(x)$ that satisfies **all** the properties.

   (a) $f(x)$ has domain $(-\infty, +\infty)$
   (b) $f(x)$ is continuous everywhere except at $x = -1$ and at $x = 3$
   (c) $\lim_{x \to -1} f(x)$ doesn’t exist
   (d) $\lim_{x \to 3} f(x)$ exists.

5. Find the following limits. Simplify your answers.

   (a) $\lim_{x \to \frac{\pi}{4}} x \sin x$
   (b) $\lim_{x \to \log_2 5} (2^x - 8)$
   (c) $\lim_{x \to 0} \frac{e^x - 1}{e^{2x} - 1}$
   (d) $\lim_{x \to 0} \left( \ln \left( 2x + \frac{1}{\sqrt{e}} \right) \right)$

6. Do the following problems on page 122 of the text: # 34 (hint1), 35.

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1 **Hint for problem 34:** The independent variable of the function is $r$, and $R$ is a constant (the radius of the earth).