Math 151 Quiz #2 Answers

1. (a) $\lim_{t\to 1} \dfrac{4t+4}{3t^2+4t+2} = \dfrac{8}{9}$ (We can calculate the limit by evaluating the expression at $t=1$ since it is defined at $t=1$.)

   (b) $\lim_{x\to -4} \dfrac{x^3+4x^2}{x^2+x-12} = \lim_{x\to -4} \dfrac{x^2}{x-3} = -\dfrac{16}{7}$ (We can divide out a common factor of $x+4$ from the numerator and denominator and then evaluate the expression at $x=-4$.)

   (c) $\lim_{n\to 3} \dfrac{2+e^n}{\sqrt{\sin(\pi n)+n+1}} = \dfrac{2+e^3}{\sqrt{\sin(3\pi)+3+1}} = \dfrac{2+e^3}{2}$ (Evaluate the expression at $n=3$. Note: $\sin(3\pi)=0$)

   (d) $\lim_{x\to 3^-} \dfrac{e^x}{|x-3|} = \infty$ (Note: The limit is infinite since the numerator is approaching a non-zero number (e^3) and the denominator is approaching 0. Since the numerator is positive near $x=3$ and the denominator is positive (absolute values are always non-negative), the limit must be $+\infty$.

   (e) $\lim_{x\to 3^+} \dfrac{e^x}{|x-3|} = \infty$ (Exact same reasoning as part (d).)

2. The function $g(x)$ is continuous at all real values except $x=1$ or $(-\infty,1)\cup(1,\infty)$.

   Here's why:
   Note that $\frac{1}{x-1}$ is discontinuous $x=1$ and continuous for all other values of $x>0$, so $g(x)$ is continuous for $x>0$ except at $x=1$.

   Also note that x^2-1 is continuous for all values $x<0$.

   The only other x-value that must be checked for continuity is $x=0$. Note that:

   - $g(0) = 0^2 - 1 = -1$.
   - $\lim_{x\to 0^-} g(x) = \lim_{x\to 0^-} x^2 - 1 = -1$
   - $\lim_{x\to 0^+} g(x) = \lim_{x\to 0^+} \dfrac{1}{x-1} = -1$

   $$\Rightarrow \quad \lim_{x\to 0} g(x) = -1$$

   Since $g(0) = \lim_{x\to 0} g(x)$, g is continuous at $x=0$. (The function does **not** have a jump at $x=0$.)