MATA30 Term Test 2 - 5pm

1. Consider the function $f(x) = \begin{cases} \dfrac{(x+1)\sin x}{x^3+2x^2+x} & \text{if } x \neq 0, \\ 1 & \text{if } x = 0. \end{cases}$

   Which of the following statements is true?

   A. $f(x)$ is continuous at $x = 0$.

   B. $f(x)$ has a (finite) jump discontinuity at $x = 0$.

   C. $f(x)$ has an infinite discontinuity at $x = 0$.

   D. $f(x)$ has a removable discontinuity at $x = 0$.

   E. None of the above.

Solution: The answer is A. Partial marks were awarded for other answers arrived at by making a common mistake. Evaluating the limit as x approaches zero (and recalling that $\lim_{x\to 0} \dfrac{\sin x}{x} = 1$) gives