Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

The Exact Solution of The Pioneer Anomaly According to The General Theory of Relativity and The Hubble's Law AZZAM ALMOSALLAMI, University of Malaya — Radio metric data from Pioneer 10/11 indicate an apparent anomalous, constant, acceleration acting on the spacecraft with a magnitude $\sim 8 \times 10^{-10}$ m/s^2, directed towards the Sun[1,2]. Turyshev [7] examined the constancy and direction of the Pioneer anomaly, and concluded that the data a temporally decaying anomalous acceleration $-2 \times 10^{-11} \frac{m}{s^2 yr}$ with an over 10% improvement in the residuals compared to a constant acceleration model. Anderson, who is retired from NASA's Jet Propulsion Laboratory (JPL), is that study's first author. He finds, so "it's either new physics or old physics we haven't discovered yet." New physics could be a variation on Newton's laws, whereas an example of as-yet-to-be- discovered old physics would be a cloud of dark matter trapped around the sun[12]. In this paper I introduce the exact solution for the Pioneer anomaly depending on the general theory of relativity and the Hubble's law. According to my solution, there are two terms of decelerations that controls the Pioneer anomaly. The first is produced by moving the Pioneer spacecraft through the gravitational field of the Sun, which causes the velocity of the spacecraft to be decreased according to the Schwarzschild Geometry of freely infalling particle. This deceleration is responsible for varying behaviour of the Pioneer anomaly in Turyshev [7], depending on $1/r^{2.5}$ the distance from the sun. The second term is produced by the attractive force of the dark matter which is constant and equals to the Hubble's constant multiplied by the speed of light in vacuum.

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Date submitted: 21 Sep 2011 Electronic form version 1.4