The role of differential equations (DEs) is very important in the modern technological era to inter-relate and solve a variety of routine daily life problems. Several approaches (algebraic, numerical and graphical) have been developed and more are being developed to make DEs course more effective and valuable. Several studies also have well elaborated the students' epistemological math problem solving beliefs, goal orientations and self-regulated learning (SRL) towards DEs problem solving. However, in spite of the great importance of these factors, no study had related these three factors. Therefore, this quantitative correlational study was designed to relate and model these three factors particularly for DEs problem solving. The purpose of this study was to explore the factors affecting DEs problem solving, particularly epistemological math problem solving beliefs, goal orientations and self-regulated learning strategies at pre-university level students in a selected province in Pakistan. Specifically, the objectives of this study were i) to investigate the direct effect of epistemological math problem solving beliefs, usefulness, goal orientations and self-regulatory learning (SRL) strategies towards differential equation problem solving and; ii) to examine the mediating role of goal orientations and self-regulatory learning (SRL) strategies. Three different types of the adapted questionnaires along with an assessment test containing five self-developed non-routine differential equation tasks were distributed to 430 pre-university students, studying in public and private institutions. Collected data was analyzed using SPSS and SmartPLS software. Both direct and indirect effects of the selected factors on DE problem solving were measured. The analysis of the direct paths revealed that epistemological math problem solving beliefs, self-regulated learning strategies, and goal orientations strongly affected the DE problem solving. In the second phase of the study, mediation roles were identified. For this, initially the mediation effects of goal orientations (mastery, performance and avoidance goals) were considered. The findings revealed that epistemological math problem solving beliefs strongly affected the DE problem solving via mastery, performance, but the effect of avoidance goal was non-significant and negative. While considering the mediation effect of self-regulated learning strategies (critical thinking and elaboration), results revealed that epistemological math problem solving beliefs strongly affected the DE problem solving via elaboration, however, through critical thinking no significant effects were observed. Finally, findings have shown that elaboration had played the role of mediation for master and performance goals, while no such effect was observed for avoidance. Overall it can be concluded that epistemological math problem solving beliefs, goal orientations (both mastery and performance goals) and elaboration can be effectively employed to boost up the students' ability to solve DE problems and to ensure that teaching and learning of differential equation may become more effective and meaningful.