Problem 1. Sensitivity Analysis for content publisher

Content publishers such as The New York Times, The Washington Post and The Wall Street Journal generate revenue by using display advertisements. The Washington Post's website contains several different sections including Sports and National. The number of views each section gets per day can be estimated by analyzing historical data. Assume that the Sports section gets six million views per day and the National section get five million views per day. Assume four companies, GEICO, Delta, T-Mobile and Capital One, wish to advertise on the Sports and National sections of the Washington Post and they contract directly with the newspaper. For each company, the contract specifies the number of times its display ads are shown in these two sections. The contracts sometimes also specify a total number of page views that can originate from any section of the newspaper. The page views promised by The Washington Post to each advertiser are summarized in the left table below. Assume that the contract also specifies that The Washington Post receives $2.40per click-through from each of the four companies. However, not every page view leads to a click. If every 1000 views leads to 5 clicks, the click-through rate is 0.5%. Newspapers use historical data and trackingtechnologies to determine click-through rates. Assume that the relevant click-through rates are given in the right table below.

Company	Sports	National	Total
GEICO	2 million	1 million	-
Delta	-	1 million	2 million
T-Mobile	1 million	1 million	3 million
Capital One	-	-	2 million

Contracts

Company	Sports	National
GEICO	2.5%	0.8%
Delta	2.0%	1.0%
T-Mobile	1.0%	3.0%
Capital One	1.5%	2.0%

Click-Through Rates

1. Write out the optimization problem. Make sure to detail the decision variables, the objective function and the constraints.
2. What is the optimal solution? Give the values of the decision variables and the optimal objective function value.
3. Conduct sensitivity analyses of the optimal solution to different click-through rates as given in the table below. Do one cell at time if you want, e.g., sensitivity of the solution to different CTRs for GEICO in the Sports section, then in the National section; then do the same for each advertiser.
4. Write no more than one paragraph (no more than 300 words)to describe the results of your analyses.Tables or graphs can be provided as supplemental material

	Sports	National
Geico	From 2% to 3%	From 0.1% to 1.1%
Delta	From 1.5% to 2.5%	From 0.5% to 1.5%
T-Mobile	From 0.5% to 1.5%	From 2.5% to 3.5%
Capital One	From 1.5% to 2.0%	From 1.5% to 2.5%