

Math 480 HW 1 2022. Due Wednesday, Aug. 31. The **first 4 problems** are Calculus review. **Two pages, 6 problems.** Problems 5 and 6 are probability problems. Calculus is very important in this class.

Place your solutions on a separate sheet of paper. DO NOT place solutions side by side.

YOU ARE BEING GRADED FOR WORK NOT JUST THE FINAL ANSWER. As a rule of thumb, you should have some idea of what you were doing, even without the book. You are encouraged to form groups to discuss ideas and HW problems, but do not copy.

The calculus I review and exam 1 review on the course webpage (<http://parker.ad.siu.edu/Olive/M480.html>) may be useful.

1) Find the derivative $m'(t)$ if $m(t) = \exp[\lambda(e^t - 1)]$ where $\lambda > 0$ is a **known constant**. (Note: $\exp(t) = e^t$.)

2) Find $\int_{\theta}^{\infty} 3\theta^3 y^{-3} dy$. (Treat θ as a known positive constant.)

3) Let $K(\theta) = n \log(\theta) + c(\theta - 1)$ where $c < 0$ and $n > 0$ are known constants. (In this course, $\log(t) = \ln(t) = \log_e(t)$, the natural logarithm of t .) To find the global maximizer θ_M of $K(\theta)$, use the following steps.

a) Find $\frac{d}{d\theta}K(\theta)$, set the resulting derivative equal to zero, and solve for θ .

b) Show that $\frac{d^2}{d\theta^2}K(\theta) < 0$.

4) Find $\int_0^3 y^2 \frac{2}{9} y dy$.

There is a second page for problems 5) and 6).

- 5) The proportions of blood phenotypes, A, B, AB, and O, in the population of all Caucasians in the United States are approximately 0.41, 0.10, 0.04 and 0.45, respectively. A single Caucasian is chosen at random from the population.
- List the sample space for this experiment.
 - Make use of the information given above to assign probabilities to each of the sample events.
 - What is the probability that the person chosen at random has either type A or type B blood?
- 6) An oil prospecting firm hits oil or gas on 10% of its drillings. If the firm drills two wells, the four possible simple events and three of their associated probabilities are given in the table below.

Simple Event	Outcome of First Drilling	Outcome of Second Drilling	Probability

E1	Hit (oil or gas)	Hit (oil or gas)	0.01
E2	Hit	Miss	?
E3	Miss	Hit	0.09
E4	Miss	Miss	0.81

- Find the probability that the company will hit oil or gas on the first drilling and miss on the second.
- Find the probability that the company will hit oil or gas on at least one of the two drillings.

comment: For a) use the fact that the probabilities sum to one. For b), find the sample points in the event, then sum their probabilities.