Michigan State University **March 23, 2024**
CMSE381 - Data Science

CMSE381 - Quiz 8

Print Name: _____

1. We want to find the values of β_0, β_1, c such that the function $f(x)$ is a cubic spline. Please list the three equations we can set up for the three unknowns (no need to solve them).

$$f(x) = \begin{cases} 1 + \beta_0 x + x^3, \text{if } x < c \\ 1 + \beta_1 x + x^2, \text{ if } x \geq c \end{cases}$$

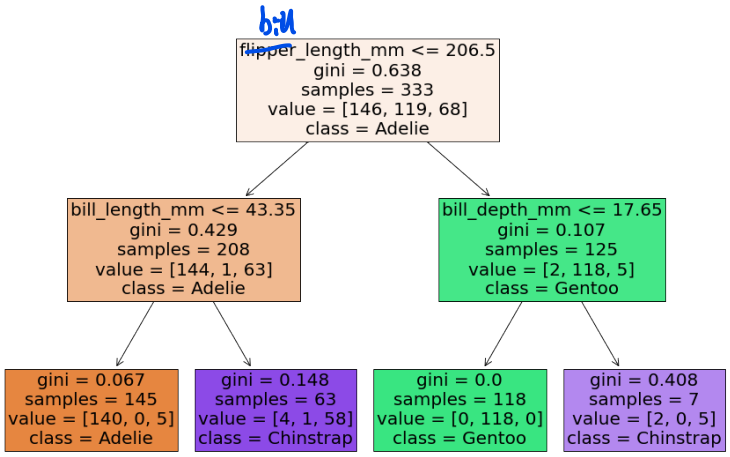
$\lim_{x \to c^-} f(x) = \lim_{x \to c^+} f(x) \Rightarrow 1 + \beta_0 c + c^3 = 1 + \beta_1 c + c^2$

$\lim_{x \to c^-} f'(x) = \lim_{x \to c^+} f'(x) \Rightarrow \beta_0 + 3c^2 = \beta_1 + 2c$

$\lim_{x \to c^-} f''(x) = \lim_{x \to c^+} f''(x) \Rightarrow 6c = 2$

2. You've generated a decision tree for the Palmer Penguin data set. (a) What would the tree below predict for the data point listed below?

	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	year	island_Dream	island_Torgersen	sex_male
290	45.9	17.1	190.0	3575.0	2007	1	0	0



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(b) what is the partition of plane defined by this tree?