Calculus Field Day   Practice Pre-Calculus Session 2 (Graphing Calculator permitted)

School: _____

Team Members: _____

_____

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Part II. (30 minutes; A graphing calculator is permitted.)

Each team has 30 minutes to answer three questions.

Each team submits one set of answers at the end of the thirty minutes. You must cross out (without penalty) whatever you do not wish to be considered.

You must show steps and reasoning. Partial credit will be given. Round off final answers to three decimal places, e.g., 1.8746 becomes 1.875. Remember to include units: feet/second, meters, etc.

1.) A new regional online newspaper with a small market niche estimates that its annual profit from advertising is modeled by

$$P(x) = -0.5x^3 + 8x^2 + 2x + 160$$

thousand dollars when its circulation is x **thousand subscribers**, for $0 \leq x \leq 100$. Currently there are 5,000 subscribers and the number of subscribers is increasing at the rate of 2,000 per year.

a.) What is the current profit?

b.) How many **subscribers** will there be in two years?

c.) Write down a formula $x(t)$ for the number of subscribers as a function of time in years.

d.) Is profit increasing, decreasing, or constant when there are 9000 subscribers? Explain how you know this.

e.) Write down a formula for the profit, P, as a function of time, t. You do not need to simplify it.

f.) At how many years will the profit be a maximum? (Round to the nearest year). Give your reasoning.

2.) The following chart shows the average weight of a baby girl at various time periods in months after being born.

Time (mo.)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Weight (lbs.)	7.4	9.6	11.8	13.45	14.8	15.9	16.75	17.65	18.3	19	19.5	20.2	20.75	22.25	23.8	25.15	26.7

a.) Input the above data in your calculator. According to your **table** what is the average rate of change of weight in the first six months, and in the next six months (i.e. months 0 to 6 and months 7 to 12)? Round to three decimal places and give units.

b.) Graph the data points using your graphing calculator. From linear, quadratic, exponential, cubic and logarithmic, fit a model to the given data. Why did you choose that model? Provide the formula for $w(t)$ the weight in pounds as a function of t months. Round all coefficients to three decimal places and give units.

c.) What does your **rounded** model predict for the weight of a one-year baby girl? Use three decimal places.

3.) Hikers Andrew and Brett take separate trails from their starting point P to get to their destination D. They walk at an angle of $40°$ apart from each other as shown, and stop to eat their lunch at positions A and B respectively.
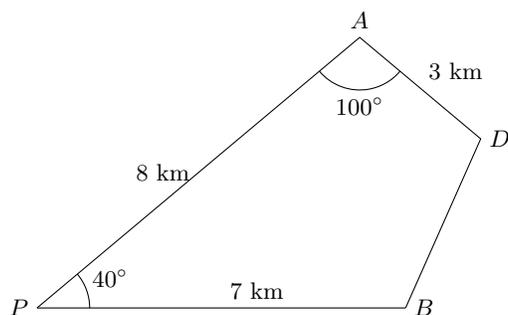
a.) How far apart are lunch positions A and B?

b.) How far does Brett still have to walk from B to reach destination D?

Round all answers to three decimal places and give units.