Name: _____   Date: _____
Math 110

Exam 3
Show all work for full credit.
Round answers to two decimal places.

1. **(5 pts)** Doctors at health services estimate that x days after the flu begins to spread at Bryant, the percentage of the student body infected by the flu is approximated by $P(t) = 2x^2 - 4x$.
   a. Find $P(3)$

   b. Find $P'(x)$

   c. Find $P'(3)$. Interpret the meaning. Use correct units.

2. **(8 pts)** Evaluate marginal cost and marginal revenue at a production level of 5 items increasing to 6 items. **Interpret the meaning of the marginal cost and revenue.** Should the company increase production?

   $$C(x) = 0.4x^2 + 12x + 27, \quad R(x) = -3x^2 + 60$$

3. **(12 pts)** Given $f(x) = -2x^3 + 3x^2 + 12x - 5$

    a.   Find the first derivative

    b.   Find the critical values

    c.   Find the second derivative

    d.   Evaluate $f''(x)$ for all critical values. Find the coordinates of the maximums/minimums

Maximum: _____

Minimum: _____

4. **(10 pts)** The number of hits (in thousands) on a company's website x hours after a news story break can be approximated by $H(x) = 20xe^{-0.4x}$.

    a. Find $H(5)$

    b. Find $H'(x)$

    c. Find $H'(5)$ and interpret the meaning. Include the correct units.

5. **(6 pts)** The number of electric vehicles, in thousands, in use in the United States can be modeled by $E(x) = 0.16x^3 - 2.44x^2 + 28.66x - 1.97$, where x is years since 2000.

    a. Find $E(25)$

    b. Find $E'(x)$

    c. Find $E'(25)$ and interpret the meaning. Use correct units.

6. **(10 pts)** A company that makes designer hairbrushes has a weekly profit function, in dollars, of $P(x) = 500 + 3x + 0.1x^2 - \ln(x)$, where x is the number of hairbrushes made and sold.

   a. Find $P(200)$

   b. Find $P'(x)$

   c. Find $P'(200)$ and interpret the meaning. Use correct units.

7. **(10 pts)** The temperature T of a person during an illness is given by $T(x) = -0.1x^2 + 0.6x + 101.1$, where T is the temperature in degrees Fahrenheit x days after the onset of the illness.

   a. Find the average rate of change in the person's temperature between day 2 and day 8 of the illness. Make sure to include correct units.

   b. Find $T'(x)$

   c. Find $T'(5)$. Interpret the meaning. Make sure to include correct units.

8. **(12 pts)** Given $f(x) = -2x^3 + 6x^2 - 18$

   a. Find the first derivative
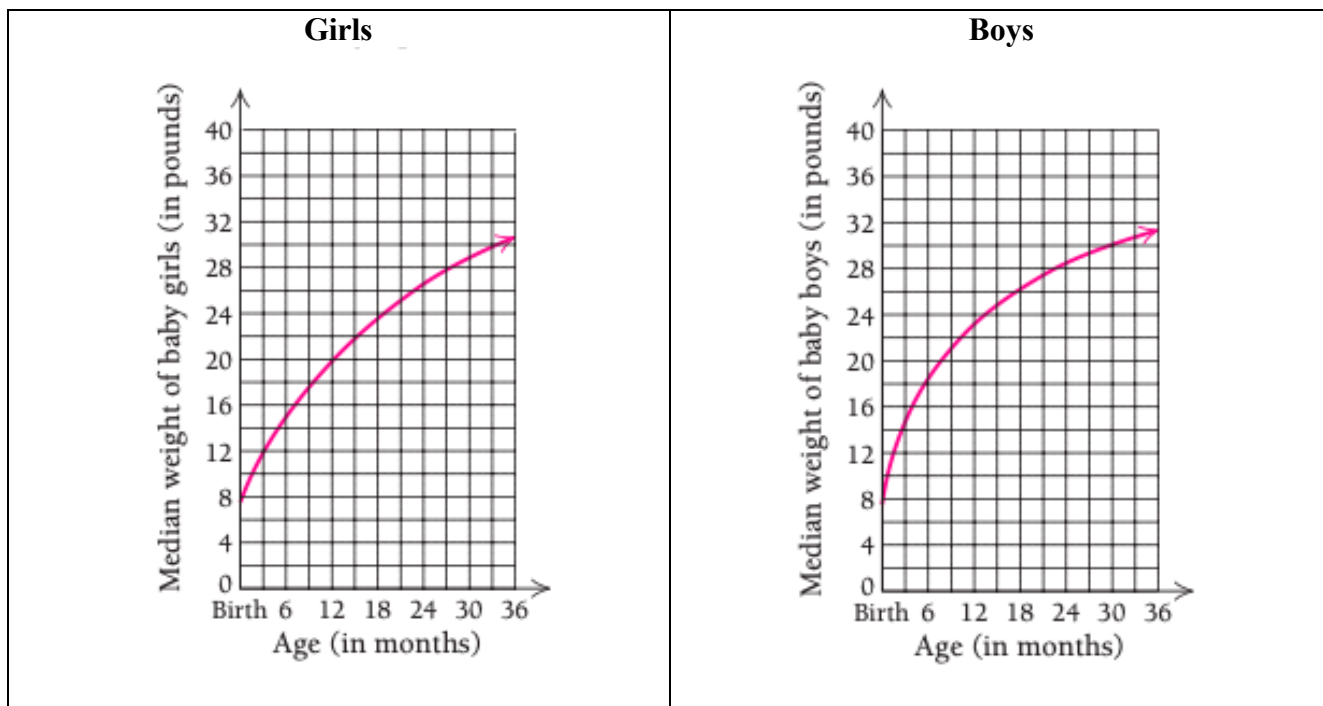
   b. Find the critical values

   c. Find the second derivative

   d. Evaluate $f''(x)$ for all critical values. Find the coordinates of the maximums/minimums

Maximum: _____

Minimum: _____

9. **(7 pts)** The median weight of baby girls and baby boys, in pounds, between 0 and 36 months are shown in the graphs below.

a. Find the average rate of change in a baby girl's weight between 6 months and 18 months. Make sure to include correct units.

b. Find the average rate of change in a baby boy's weight between 6 months and 18 months. Make sure to include correct units.

c. Between 6 and 18 months, which sex is gaining weight at a greater rate?

10. **(10 pts)** A company's sales x months after starting an advertising campaign can be modeled by $S(t) = \frac{10x^2 - 6}{x^2 + 11}$ thousand dollars.

    a. Find $S(3)$

    b. Find $S'(x)$

    c. Find $S'(3)$ and interpret the meaning. Use correct units.

11. **(10 pts)** Given $f(x) = x^2 - 4x - 12$

    a.   Find the first derivative

    b.   Find the critical values

    c.   Find the second derivative

    d.   Evaluate $f''(x)$ for all critical values. Find the coordinates of the maximums/minimums

Maximum: _____

Minimum: _____