1)   Find each point of inflection for the graph of the function
(10 points)
$$g(x) = x^4 + 2x^3 - 36x^2 - 4x + 6.$$ Write as ordered pair(s).

Point(s) of Inflection:

2)   Find the **equations** of any horizontal or vertical asymptotes. If there are none, write
        'none' in the appropriate box.
(10 points)
$$y = \frac{2x^2 + 8x + 9}{(x+2)^2}$$

Vertical asymptote equation:

Horizontal asymptote equation:

3)   For the function $h(x) = 3x^4 - 4x^3 - 12x^2 + 17$:
(14 total points)

     a)   Find any interval(s) where the function is increasing (using interval notation). If there are none, write 'none'. (7 points)

     b)   Find the **x value(s) only** for the location(s) where there is(are) any relative minimum(s). (7 points)

a)   Increasing interval(s)

b)   Relative minimum(s) at....

3)   The Tippecanoe County Highway Department has been analyzing data concerning the average velocity of traffic on Interstate 65 flowing past the exit at Highway 38 on a normal weekday between 5 AM and 8 AM. The data suggest that the average velocity of traffic can be modeled by the function $v(t) = \dfrac{4}{3}t^3 - t^2 - 6t + 65$ for $0 \le t \le 3$; where t is in hours with $t = 0$ corresponding to 5 AM and $t = 3$ corresponding to 8 AM and velocity is in miles per hours.

(14 total points)

     a)   Find the time when there is a relative minimum of this velocity function. What clock time (AM time) does this represent?   (7 points)

     b)   What is the average velocity at that time?   (7 points)
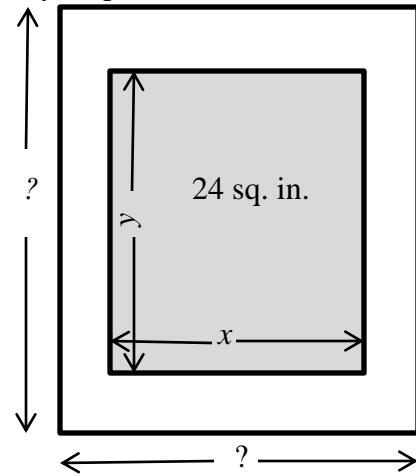
a)

           AM

b)

           mph

5)   Susan asks a copy shop to create a small poster that has a printed area of 24 square inches. She requests margins of 1 inches on each side and margins of 1 ½ inch at the top and bottom. Find the length and width of the outside of the poster that gives a minimum area (minimum amount of paper). The picture below may help.
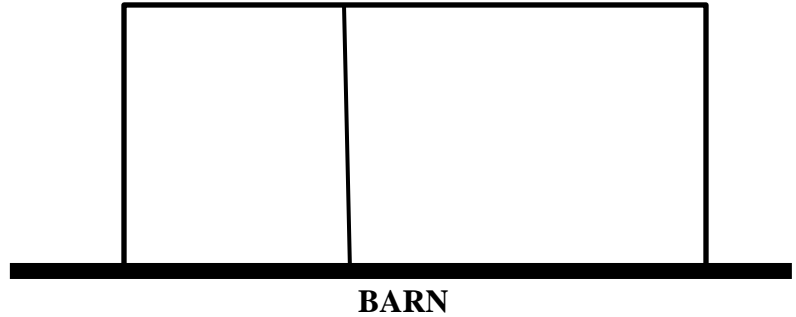
(14 points)

```
       ┌─────────────────────────┐
       │   ┌─────────────────┐    │
   ↑   │   │↑                │    │
   ?   │   │                 │    │
       │   │y   24 sq. in.   │    │
   │   │   │                 │    │
   ↓   │   │↓___x___         │    │
       │   └─────────────────┘    │
       └─────────────────────────┘
           ←────── ? ──────→
```


Width:
Length:

6)   A farmer is planning a rectangular enclosure divided into two sections. He will use a long barn as one side of the enclosure. He has 600 feet of fencing material and will not need to fence along the side next to the barn. (See picture below.) Find the outside dimensions of the enclosure that would make the largest total possible area.

(14 points)
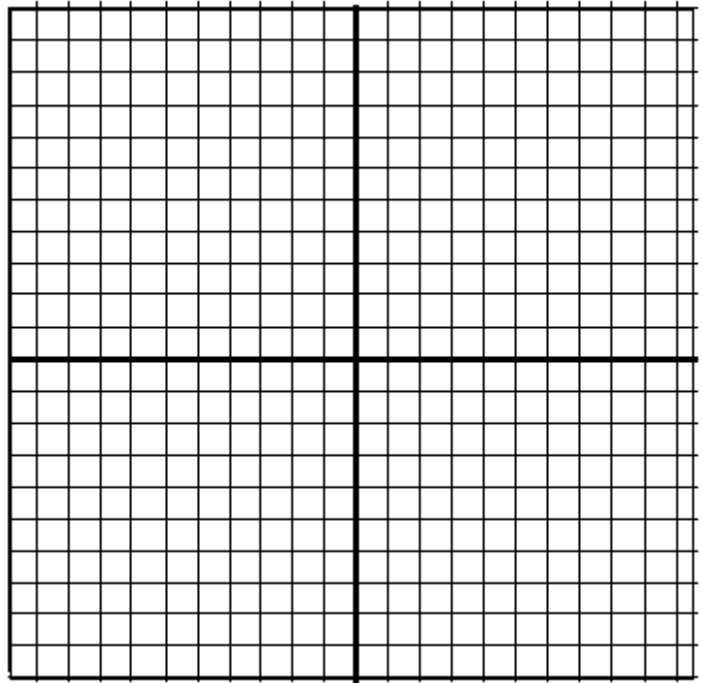
BARN

feet wide
feet long

7)   Use the guidelines for sketching curves to sketch this function. Clearly put a scale on each axis.

(14 points)

$$y = x^3 - 6x^2 + 9x + 2$$

Find and circle this information.
a)   Any intercepts
b)   Intervals of Increasing/Decreasing
c)   Any relative maximum(s) or relative minimum(s)
d)   Intervals of concavity
e)   Any point(s) of inflection

8)   The manufacturer of tennis rackets finds that the total cost (in dollars) of manufacturing x
        rackets/day is given by the cost function $C(x) = 0.0001x^2 + 4x + 400$. Each racket can be
        sold at a price of p dollars, with a demand function of $p = 10 - 0.0004x$. Find the
        number of rackets that can be made and sold daily to yield a maximum profit for the
        manufacturer. (Assume all rackets made are sold.)

Reminder: Revenue = (price/unit)(number of units)
            Profit = Revenue - Cost

(10 points)

Rackets/day