MATH 183 EXAM 2(S)

Show all work for full credit!

1) Find the critical points of the function $f(x) = 2x^2(x-3)^8$.

2) Determine the intervals on which the following functions are increasing and decreasing and classify each of the critical points as a relative minimum, a relative maximum, or neither one.

   a) $f(x) = \dfrac{3}{4}x^4 + 4x^3 + 6x^2 + 48$

   b) $g(x) = x^6 - 6x^5 - 21x^4$

3) Determine the intervals on which the following functions are concave up and concave down.

   a) $h(x) = x^4 + 4x^3 - 90x^2 - 360x$

   b) $f(x) = \dfrac{2x}{x-5}$

4) After t hours a passenger train is $s(t) = 21t^2 - \dfrac{7}{6}t^3$ miles due east of its starting point (for $0 \le t \le 18$).

   a) Where is the train (relative to its starting point) after 10 hours?

   b) What is the velocity of the train after 10 hours?

   c) What is the acceleration of the train after 10 hours?

   d) In what direction is the train traveling after 10 hours?

   e) Is the train speeding up or slowing down after 10 hours? How can you tell?

5) Find the absolute extreme values of $f(x) = 3x^5 - 15x^4 - 25x^3$ on the interval [-2, 3].

6) A lemon grower finds that if she plants 44 trees per acre, each tree will yield 56 bushels of lemons. She also estimates that for each additional tree that she plants per acre, the yield of each tree will decrease by 2 bushels. How many trees should she plant per acre to maximize her harvest and what is the maximum harvest?

7) A homeowner wants to enclose a 3,800 square foot rectangular garden by a fence in his backyard. If 3 sides of the fence cost $6.75 per foot and the 4th side costs $10.25 per foot, find the dimensions that will minimize the cost of building the fence and the minimum cost of its construction.

8) Suppose that a company decides to raise capital by selling stock. Over the next 20 years the average monthly price of the stock fluctuates according to the rule $S(t) = -9.72\sqrt[3]{t} + 0.09t + 49.75$ where $S(t)$ is in dollars per share and t is the number of months since the stock was first offered for sale (this means that $S(t)$ is only valid on the interval [0, 240]). Determine the maximum and minimum prices of the stock and when these prices occurred.

Problem #/Point Value: #1 – 10 pts, #2 – 10 pts each, #3 – 10 pts each, #4 – 10 pts,

                          #5 – 10 pts, #6 – 10 pts,   #7 – 10 pts,   #8 – 10 pts