

Quiz 6 Solution - Math 165

Name: _____

Show and justify all work to receive maximum credit for each problem. You may not use your book, notes, or a calculator on this quiz. Give exact answers, not decimal approximations. Do not give answers as mixed fractions. This quiz is worth 20 points.

1. (6 points) Let $f(x) = x^3 - 6x^2 + 6x + 4$. Find all intervals over which f is concave up and where f is concave down. Identify all inflection points.

Solution: f is concave down on $(-\infty, 2)$ and concave up on $(2, \infty)$. Hence $x = 2$ is an inflection point.

2. (6 points) Use the Second Derivative Test to find all local minimum and local maximum values for the function $h(x) = \frac{1}{3}x^3 + \frac{1}{2}x^2 - 2x - 8$ defined on $(-\infty, \infty)$.

Solution: $f(-2)$ is a local maximum and $f(1)$ is a local minimum.

3. (8 points) A box with an open top is to be constructed out of two materials. The bottom of the box must be a square and is made out of a material that costs 2 dollars per square foot. The sides of the box are constructed out of a material that costs 1 dollar per square foot. If the box must have a volume of 10 cubic feet, what dimensions will minimize the cost of the box?

Solution: The cost is minimized when the box has dimensions $\sqrt[3]{10} \times \sqrt[3]{10} \times \frac{10}{\sqrt[3]{100}}$