

Show all of your work and box in your answers. A correct answer with no work will receive little or no credit. Calculators are not permitted.

1.a) State conditions under which a function would be guaranteed to have an absolute max and an absolute min:

b) Find any absolute max or mins for the function: $y = 9 - x^2$ on the interval $[-3,2]$.

2a) State the Mean Value Theorem.

b) Find a value of "c" that satisfies the MVT for the function $y = x^{\frac{2}{3}}$ on $[0,1]$.

3. For the function: $y = x^4 - 4x^3 + 4x^2$, find the following:

a) critical points of the first derivative

b) a first derivative chart

c) any extrema (list and label if they are max or min)

d) intervals where the function is increasing and decreasing

e) draw a sketch of the shape of the function, label where critical points are

4. Given the function: $y = 2x - 3x^{\frac{2}{3}}$ $y' = \frac{2(x^{\frac{1}{3}} - 1)}{x^{\frac{1}{3}}}$ $y'' = \frac{2}{3x^{\frac{4}{3}}}$

Give the following:

a) first derivative chart

b) extrema

c) second derivative chart

d) inflection points

e) draw an accurate sketch of the graph labeling the critical points

The following are all points on the graph – only **use those that are critical points** in sketching the graph: $(1,-1)$, $(8, 4)$ $(0,0)$ $(-1, 1)$ $(27,27)$

5. a) Two cars are leaving an intersection at the same time. Car A is traveling west at 20 miles per hour and Car B is traveling south at 30 miles per hour. At the moment when Car A is 8 miles from the intersection and Car B is 6 miles from the intersection, how fast is the distance between the cars changing?

6. Which of the following graphs is the function and which is the derivative of that function?

Give a reason for your choice.