Practice Exam 2

Name:
Section Number:

Read all of the following information before starting the exam:

- **CALCULATORS ARE NOT ALLOWED**.

- Show all work, clearly and in order using proper notations, if you want to get full credit. We reserve the right to take off points if we cannot see how you arrived at your answer (even if your final answer is correct).

- Box or otherwise indicate your final answers.

- Please keep your written answers brief; be clear and to the point. We will take points off for rambling and for incorrect or irrelevant statements.

- This test has 6 pages total including this cover sheet and the scrap page and is worth 115 points. It is your responsibility to make sure that you have all of the pages!

- Good luck!

Question 1	10	
Question 2	5	
Question 3	5	
Question 4	10	
Question 5	10	
Question 6	10	
Question 7	20	
Question 8	10	
Question 9	10	
Question 10	10	
Question 11	15	
Total	115	

1. **10 pts** Determine whether the statement is true or false. If the statement is false explain why.

   a) If the f has an absolute maximum value at z, then the $f'(z) > 0$

      (TRUE / FALSE)

      SOLUTION FALSE because at either maximum or minima then $f'(z) = 0$ or be undefined or its on the interior of the domain.

   b) The function $f(x) = 2x(x + 4)^3$ has inflection points at: (0,0) and (4,0)

      (TRUE / FALSE)

      SOLUTION FALSE because the inflection point is at (-4,0)   (-2, -32)

2. **5 pts** Find two negative numbers that add up to -50 whos product is large as possible.
   SOLUTION $x_1 = -25 \& x_2 = -25$

3. **5 pts** Find the local extrema and the intervals where the following function is increasing or decreasing: $f(x) = x^{\frac{2}{3}}(x - 10)$

4. **10 pts** A piano is suspended by a 90 ft rope through a pulley system that is vertically 40 ft above a man's arm. The piano is at some height above the ground. At t = 0, the man is 30 ft horizontally from the piano and walks away at 12 ft/s. How fast is the piano being pulled up?
SOLUTION $36/5 = 5.2$ ft/s

5. **10 pts** Determine the critical numbers of the following functions:

   a)
   $$V(t) = 1 + 80t^3 + 5t^4 - 2t^5$$
   SOLUTION t = 0, -4, 6

   b)
   $$Q(t) = (2 - 8x)^4(x^2 - 9)^3$$
   SOLUTION t = $\frac{1}{4}$, t = 3, t = -3, t =

6. **10 pts** Use linear approximation to find the approximate value of $\sin(122°)$
   HINT Rexpress degrees in terms of radian by using $120°$
   SOLUTION
   $\frac{\sqrt{3}}{2} + (-\frac{1}{2})(\frac{\pi}{90})$

7. **20 pts** For the following functions answer each of the following

- identify the critical points of the function and classify them as local maximum, local minimum, or neither
- identify the intervals on which the function is increasing/decreasing
- determine the interval on which the function is concave up or down
- determine the inflection points of the function
- use the information found to sketch the graph of the function

a)
$$g(t) = t^5 - 5t^4 + 8$$

SOLUTION CRITICAL POINT:$t = 0$ and $t = 4$
CLASSIFICATION OF CRITICAL POINTS:
RELATIVE MINIMUM: 4
RELATIVE MAXIMUM: 0
INCREASING: $(-\infty, 0) \cup (4, \infty)$
DECREASING: $(0, 4)$
CONCAVE UP: $(3, \infty)$
CONCAVE DOWN:$(-\infty, 0)(0, 3)$
INFLECTION POINT: $t = 3$

b)
$$x^{4/3}(x - 2)$$

8. **10 pts** A car is heading "away" from the intersection at 5 m/s. And a bus is heading "towards" the intersection on the other street (at a right angle) at 4 m/s. How fast is the distance changing when the car is is 30 m away from the intersection and the bus is 40 m from the intersection? Additionally, is the distance increasing or decreasing?
SOLUTION
distance is changing at $-\frac{2}{10}$ m/s
The distance is decreasing.

9. **10 pts** Find the horizontal asymptote(s) of the following functions:

   a)
$$\frac{8 - 4x^2}{9x^2 + 5x}$$

   SOLUTION $-\frac{4}{9}$

   b)
$$\frac{\sqrt{7 + 9x^2}}{1 - 2x}$$

   SOLUTION $x \to -\infty : y = -\frac{3}{2}$
   $x \to \infty : y = \frac{3}{2}$

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10. **10 pts** Compute the differential dy of the following functions:

a)
$$f(x) = x^2 - \sec(x)$$
SOLUTION $df = (2x - \sec(x)\tan(x))\,dx$

b) Compute the dy and $\triangle y$ for $y = x^5 - 2x^3 + 7x$ as x changes from 6 to 5.9
SOLUTION $dy = (5x^4 - 6x^2 + 7)\,dx$ and -627.1

11. **15 pts** Multiple Choice. Read each question and answer choice carefully and choose the ONE best answer.

a) A right cylindrical cone has a radius of 4 cm and a height of 2.0 cm. If the height increases at 0.5 cm/min, but the radius remains constant, then what will be the rate of change of the volume?

A) 8.4 cm^3/min
B) 1.1 cm^3/min
C) 4.2 cm^3/min
D) 2.1 cm^3/min

SOLUTION A)8.4

b) Given that the cost function $C(x) = 144 + 0.1x + 0.04x^2$, what is the minimum average cost per unit?

   A) 20 dollars
   B) 40 dollars
   C) 60 dollars
   D) 80 dollars

   SOLUTION C) 60 dollars

c) Find the approximate value of $(5.2)^3$ using linear approximation

   A) 130
   B) 140
   C) 150
   D) 160

   SOLUTION [B] 140