

MATH 121, Calculus I — Exam III (Spring 2014)
(sample)

Name: _____

KU ID No.: _____

This exam has a total value of 100 points. There are 9 problems in total to be solved. All but two are worth 10 points, the remaining two are worth 15 points. This is strictly a closed-book exam. **Be sure to show all work.**

Score

# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	Total

1. **[15 points]** A kite 100 ft above the ground moves horizontally at a speed of 8 ft/s. At what rate is the angle between the string and the horizontal decreasing when 200 ft of string have been let out?

Answer:

2. **[10 points]** If two resistors with resistance R_1 and R_2 are connected in parallel, then the total resistance R , measured in ohms (Ω), is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

If R_1 and R_2 are increasing at rates of $0.3 \Omega/s$ and $0.2 \Omega/s$, respectively, how fast is R changing when $R_1 = 80 \Omega$ and $R_2 = 100 \Omega$.

Answer:

3. **[10 points]** Find the local and absolute maximum and minimum values of $f(x) = 12 + 4x - x^2$ on the interval $[0, 5]$

Answer:

4. **[10 points]** Let $f(t)$ be the temperature at time t where you live and suppose that at time $t = 3$ you feel uncomfortably hot. How do you feel about the given data in each case?

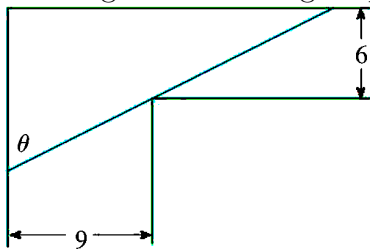
- (a) $f'(3) = 2, f''(3) = 4$
- (b) $f'(3) = 2, f''(3) = -4$
- (c) $f'(3) = -2, f''(3) = 4$
- (c) $f'(3) = -2, f''(3) = -4$

Answer:

5. [10 points] Evaluate the limit $\lim_{x \rightarrow 1} \frac{\ln x}{\sin \pi x}$

Answer:

6. [15 points] A steel pipe is being carried down a hallway 9 ft wide. At the end of the hall there is a right-angled turn into a narrower hallway 6 ft wide. What is the length of the longest pipe that can be carried horizontally around the corner?



Answer:

7. [10 points] A piece of wire 10m long is cut into two pieces. One piece is bent into a square and the other is bent into an equilateral triangle. How should the wire be cut so that the total area enclosed is at a maximum?

Answer:

8. [10 points] Use Newton's method to find a solution to $x^3 = 1 + x$.

Answer:

9. [10 points] Find the antiderivative F of $f(x) = 5x^4 - 2x^5$ that satisfies $F(0) = 4$.

Answer: