MATH 1551 Sample Midterm 3

Directions: Work on you own without reference to notes or text. Show all work to receive credit.
Answers should be as specific as possible and it should be evident how they were obtained. Work neatly.
Not allowed: formula sheet, notes, book, calculator or any electronic device. Only allowed: pen/pencil.

Name: _____

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	15	
Total:	55	

1. (10 points) Sand falls from a conveyor belt at a rate of 14 m^3/min onto the top of a conical pile. The height of the pile is always three-eights of the the base diameter. How fast is the radius changing when the pile is 5 m high? (The volume of a cone is $V = \frac{1}{3}\pi r^2 h$.)

2. (10 points) Use differentials to estimate $7e^{-0.11}$.

3. (10 points) Show that the function $g(x) = x + \sin^2(x/3) - 8$ has exactly one zero in the interval $(-\infty, \infty)$.

4. (10 points) Given that $f'(x) = (x+4)e^{-x}$, determine the critical points of f, the intervals where the function is increasing or decreasing, and points where f assumes local extreme values.

5. (15 points) Find all critical points, the open intervals where the function is increasing or decreasing, the open intervals where the function is concave up or down, and identify local and absolute extreme values and inflection points for the function

$$f(x) = x^{3/5}(x+1),$$

Use the information to sketch the graphs of $f(x)$.