Test II Calculus I

Place your name in the upper right hand corner. Place your answers in the blank spaces on the left. Show your work on a separate sheet of paper. Staple your work sheet(s) to the test when you hand it in. You may use your calculator and the trig. identities handout. :-)

1) Compute the following derivatives with respect to the variable ‘x’.

a) \( f(x) = \frac{x^2 + 2x + 1}{x + 1} \)

b) \( f(x) = \int x^1 \ln(x) \)

c) \( f(x) = x^2 e^{2\ln(x)} \)

d) \( f(x) = \cos(x^2) \)

2) Consider the following function \( f(x) = ax e^{bx^2} \). Assume \( b > a > 0 \).

a) What is the domain for \( f(x) \)?

b) List any values of ‘x’ that cause \( f(x) = 0 \).

c) What is the y intercept of \( f(x) \)?

d) Compute and simplify the first derivative of \( f(x) \).

e) Compute and simplify the second derivative.

f) What is the horizontal asymptote for the function?

g) What are the critical points?

h) What are the inflection points?

3) On a separate page graph the function given in question (2). On the graph you should indicate all of the things you computed for number (2).

4) Consider the following function. \( f(x) = e^{t\cos(t)} \). Consider only \( t \geq 0 \).

a) What are the two roots closest to \( t = 0 \)?

b) Compute and simplify the first derivative of \( f(x) \).

c) What are the two critical points closest to \( t = 0 \)? Indicate max or min.

d) Compute and simplify the second derivative.
e) What are the two inflection points closest to t = 0?

5) On a separate page graph the function given in question (4). For the domain let 0 \( \leq t \leq 3 \). Indicate all the things you found in number (4).

6) \[ \lim_{x \to 0} \frac{x + 1}{x} \bigg/ \frac{x}{x + 1} \]

7) \[ \lim_{x \to \infty} \frac{x^p}{e^x} \quad p > 0 \]

8) At noon a ship is sailing 100 km west of another ship. The first ship is sailing south at 35 km/hr and the second ship is sailing south at 15 km/hr. How fast is the distance changing at 4:30 p.m.?

9) A kite 100 meters above the ground moves horizontally at 8 m/s. At what rate is the angle between the string and the ground decreasing when 200 meters of string has been let out?

10) When air expands adiabatically its Pressure \( P \) and its volume \( V \) are related by \( PV^{1.4} = C \), where \( C \) is a constant. Suppose that at a certain instant the volume is 400 \( cm^3 \) and the pressure is 80 kPa and is decreasing at a rate of 10 kPa/min. At what rate is the volume increasing at this instant?

11) Compute the derivative of \( y(x) = \sin(cosh(x)) \)

12) Compute the derivative of \( y(x) = \sinh^{[1]}(x) \)