

Directions: Answer the following questions in the space provided. You may not use a calculator. If you do not show your work, you will receive no credit. The point value of each question is indicated. **WRITE YOUR FINAL ANSWER ON THE ANSWER LINE WHEN APPROPRIATE. IF YOU DO NOT FOLLOW DIRECTIONS YOU WILL BE PENALIZED!**

1. Compute the derivatives of the following:

(a) (7 points) $f(x) = 5x^4 - \sqrt{2}x^3 - 10x + \frac{1}{x^2} + e^3$

(a) _____

(b) (7 points) $g(x) = (x + 7)e^x$

(b) _____

(c) (7 points) $h(x) = \frac{x^2 + 5}{\sqrt{2x - 3}}$

(c) _____

(d) (7 points) $F(x) = \cos(5x^2 + 3x - 1)$

(d) _____

(e) (7 points) $G(x) = \ln(\sec x)$

(e) _____

Points earned: _____ out of a possible 35 points

2. Let $F(x) = f(x)g(x)$, $G(x) = \frac{f(x)}{g(x)}$ and $H(x) = f(g(x))$. If $f(1) = 2$, $f'(1) = -2$, $f'(3) = -5$, $g(1) = 3$, $g'(1) = 1$ and $g'(2) = 3$, compute the following:

(a) (5 points) $F'(1)$

(a) _____

(b) (5 points) $G'(1)$

(b) _____

(c) (5 points) $H'(1)$

(c) _____

Points earned: _____ out of a possible 15 points

3. (10 points) At what point(s) on the curve

$$y = (x^2 - 2x + 2)e^x$$

is the tangent line horizontal?

3. _____

Points earned: _____ out of a possible 10 points

4. (15 points) Find the equation of the line tangent to

$$y^3 + yx^2 + x^2 - 3y^2 = 0$$

at the point $(0, 3)$. (*HINT*: Use implicit differentiation.)

4. _____

Points earned: _____ out of a possible 15 points

5. A particle moves so that its position (in meters) is given by

$$f(t) = e^{t^2-2}$$

where t is measured in seconds. Find equations that give

(a) (5 points) the velocity and

(a) _____

(b) (5 points) acceleration

(b) _____

of the particle at time t .

Points earned: _____ out of a possible 10 points

6. (15 points) A 13 foot ladder is leaning against a wall. If the top of the ladder slips down the wall at a rate of 2 feet per second, how fast will the bottom of the ladder be moving away from the wall when the top of the ladder is 5 feet above the ground?

6. _____

Points earned: _____ out of a possible 15 points