

This is a closed-book, closed-notes, no-calculators test. There are 60 points possible.

Fractions and roots in answers are fine; so are negative and fractional exponents.

Use scratch paper as needed, but any work that you want graded should be written legibly on this test paper.

(1 pt) Sign below to indicate your pledge.

I pledge that I will not give, accept, or tolerate others' use of unauthorized aid in completing this work.

problems	max pts	total pts
problem 1& 2	11	
problems 3 & 4 & 5	14	
problems 6 & 7	12	
problem 8	10	
problems 9 & 10 & 11	13	
Honor code pledge	1	
Total	61	

(9 pt) 1. Use derivative rules to find $f'(x)$.

Don't spend a lot of time simplifying once all the differentiation steps are completed.

a. $f(x) = (x^2 - x - 1)^6$

b. $f(x) = \sqrt{x^4 + 16}$

c. $f(x) = x^2(3 - x)^4$

(2 pt) 2. If f is a differentiable function and $g(t) = f(1/t)$ then $g'(t) = \dots$

a. $f'(1/t)$ b. $\frac{-1}{t^2} \cdot f'(1/t)$ c. $f'(-1/t^2)$ d. $\frac{1}{f'(t)}$ e. $f(1/t) \cdot f'(1/t)$

(2 pt) 3. Suppose y is a differentiable function of x .

Choose the correct expression for $\frac{d}{dx} [2y^7]$ from the following:

a. $14y^6 \frac{dy}{dx}$

b. $14y^6$

c. 0

d. $2y^7 \frac{dy}{dx}$

e. $7y^6$

(8 pt) 4. Use implicit differentiation to find $\frac{dy}{dx}$ for the curve $x^2 + 3xy + y^3 = 15$.

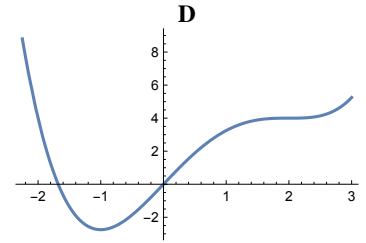
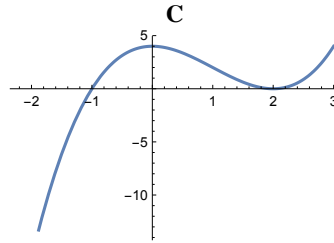
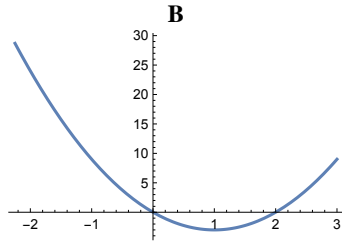
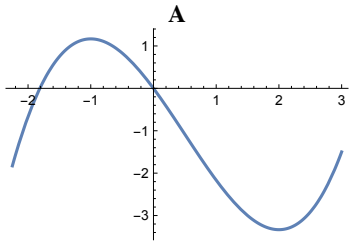
(4 pt) 5. True/False I.

You are given that $f(x)$ is a function whose derivative is $f'(x) = (x - 2)^2(x + 1)$.

_____ a. f is increasing on $(-1, 2)$.

_____ b. $f'(x)$ changes sign at $x = 2$.

_____ c. f has a relative minimum at $x = -1$.



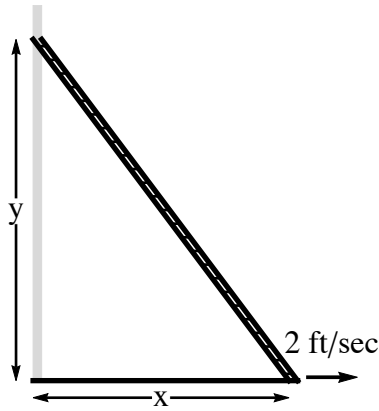
(6 pt) 6. As in the previous problem, $f(x)$ is a function whose derivative is $f'(x) = (x - 2)^2(x + 1)$.
Choose from the graphs above to answer the following:

- _____ i. Which of the above is the graph of $f(x)$?
- _____ ii. Which of the above is the graph of $f'(x)$?
- _____ iii. Which of the above is the graph of $f''(x)$?

(6 pt) 7. A moving object has its position at time t given by $f(t) = (1/3)t^3 - 5t^2 + 16t$.

Find the time interval on which the object is moving backward (in other words, the time interval during which the position function is decreasing).

(10 pt) 8. A ladder 25 feet long is leaning against the wall of a house. The base of the ladder is pulled away from the wall at a rate of 2 feet per second. Refer to the figure for the notation used in the following questions:



- i. Which of the following represents the “2 feet per second” given in the description above?
 - a. x
 - b. dx/dt
 - c. y
 - d. dy/dt
 - e. dy/dx

- ii. At the instant shown in the figure, dy/dt is...
 - a. positive
 - b. negative
 - c. zero
 - d. undefined

- iii. How fast is the top of the ladder moving down the wall when the base is 15 feet from the wall?
You may need the useful arithmetic fact that $15^2 + 20^2 = 25^2$.

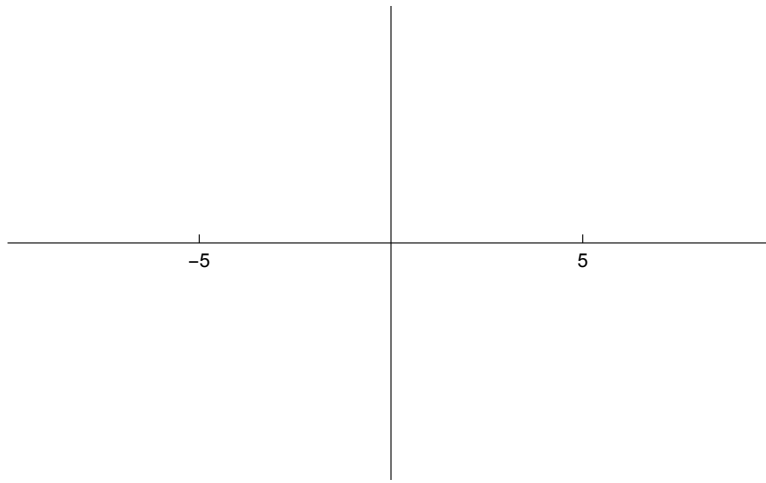
(4 pt) 9. True/False II. Assume that f is continuous on the interval $[2, 8]$.

_____ a. $f(x)$ must have an absolute maximum value on $[2, 8]$

_____ b. $f(x)$ must have at least one critical number in $[2, 8]$.

_____ c. $f(x)$ must have an absolute minimum value on $[2, 8]$.

(3 pt) 10. Use the provided axes to sketch the graph of a function which is increasing everywhere, concave up on $(-\infty, 0)$ and concave down on $(0, +\infty)$.



(6 pt) 11. The function $f(x) = x^3 - 5x^2$ has exactly one inflection point. Find its x -coordinate.