

MATH 105 EXAM #1

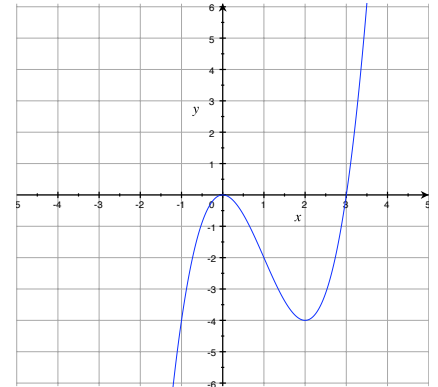
First, put your name on each page. Show all your work for partial credit. Please circle your answers. Good luck.

1.
 - (a) T or F. The derivative of a linear function is always greater than the derivative of a nonlinear function.
 - (b) T or F. The function $f(x) = mx - b$ is increasing for all x .
 - (c) T or F. $f''(3)$ represents the slope of the tangent line at $x = 3$.
 - (d) T or F. The derivative evaluated at a particular point cannot be negative.
2. If $f''(x) < 0$ for $x > 5$ and $f''(x) > 0$ for $x < 5$, can you conclude anything about $x = 5$?
3. Draw, on one graph, two functions $y = f(x)$ and $y = g(x)$ such that $f'(x) > g'(x)$ for all x .
4. Suppose you are on a cross country run and y , your distance run (in miles), is a function of the number of minutes x since you started. Thus, $y = f(x)$. What would you calculate to answer the following questions?
 - (a) How far have you run after 40 minutes?
 - (b) How fast have you run over the first 25 minutes?
 - (c) How fast are you running at the 25 minute mark?
5. For the function $y = f(x)$, where x = time (days of the year) and y = inches of rainfall per day, draw a continuous function that you believe describes the relationship between x and y . Explain why you drew the function as you did. Is your function nonlinear? Circle the place on your graph at which the instantaneous rate of change of rainfall with respect to time is greatest.

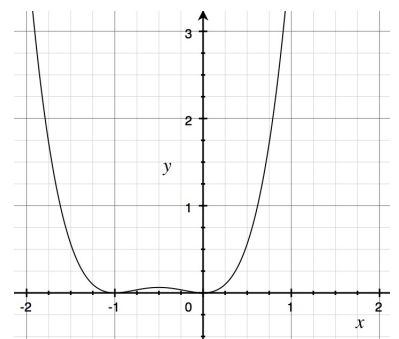
6. Find the instantaneous rate of change for $f(x) = x^3 - \sqrt{x}$ at $x = 1$. Is the function increasing or decreasing there?

7. Find the critical points of $h(x) = x^3 - 4.5x^2 + 6x - 13$.

8. Compute the equation of the tangent line for $y = x^3 - 3x^2$ at $x = -1$. Draw this on the graph below.



9. Find all values of x where the tangent line to $f(x) = x^4 + 2x^3 + x^2$ is horizontal. Locate these points on the graph of $f(x)$ below. Does this make sense?



10. Find the inflection points and intervals of concave up and concave down for $f(x) = \frac{1}{4}x^4 - \frac{2}{3}x^3 + \frac{1}{2}x^2 - 2x$.