

TEST 1A

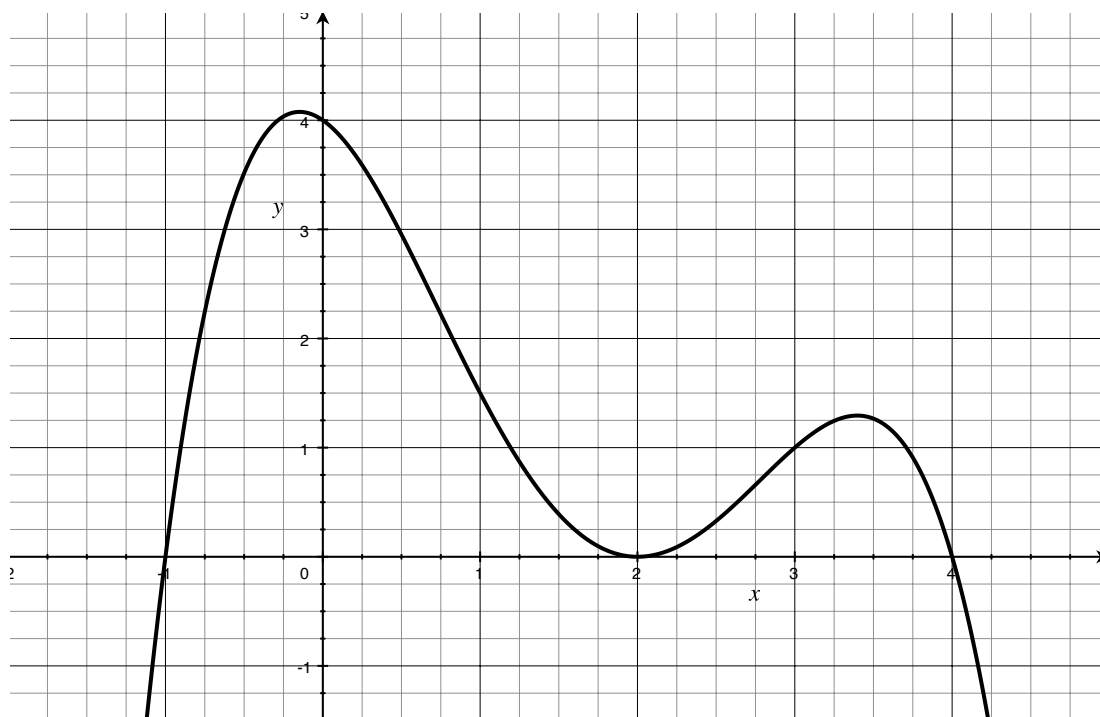
Math 105
2/7/14

Name: _____
by writing my name I swear this work is my own

Read all of the following information before starting the exam:

- Show all work, clearly and in order, if you want to get full credit. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Circle or otherwise indicate your final answers.
- Please keep your written answers brief; be clear and to the point. I will take points off for rambling and for incorrect or irrelevant statements. Put a smiley face next to your name for one point.
- This test has 6 problems and is worth 100 points, It is your responsibility to make sure that you have all of the pages!
- Good luck!

1. (30 points) The following is a graph of $g'(x)$, NOT $g(x)$.



- a. (3 pts) What is $\lim_{h \rightarrow 0} \frac{g(1+h) - g(1)}{h}$?
- b. (4 pts) Estimate $g''(3)$ by drawing in a tangent line.
- c. (3 pts) On what interval(s) is $g(x)$ increasing?
- d. (3 pts) On what interval(s) is $g(x)$ concave down?
- e. (6 pts) Where does $g(x)$ have stationary points? Classify each as max points, min points, or neither.
- f. (3 pts) Where does $g(x)$ have inflection points?
- g. (4 pts) Sketch and label the graph of $g''(x)$ on the graph above.
- h. (4 pts) Sketch and label a possible graph of $g(x)$ on the graph above.

2. (15 points)

a. (10 pts) Use the limit definition of the derivative to find $f'(x)$ if $f(x) = 3x^2 + 7x + 1$.

b. (5 pts) Find the equation of the line tangent to $f(x) = 3x^2 + 7x + 1$ for $x = -1$.

3. (9 points) Determine the following using the power rule and sum/difference rule. Rewrite the final answer to remove all negative and fractional exponents.

$$\frac{d}{dx} \left(2\sqrt[3]{x^5} + \frac{3}{5x^2} - 2x^{-3} + 5x + 2^3 \right)$$

4. (18 points) Using derivatives and antiderivatives

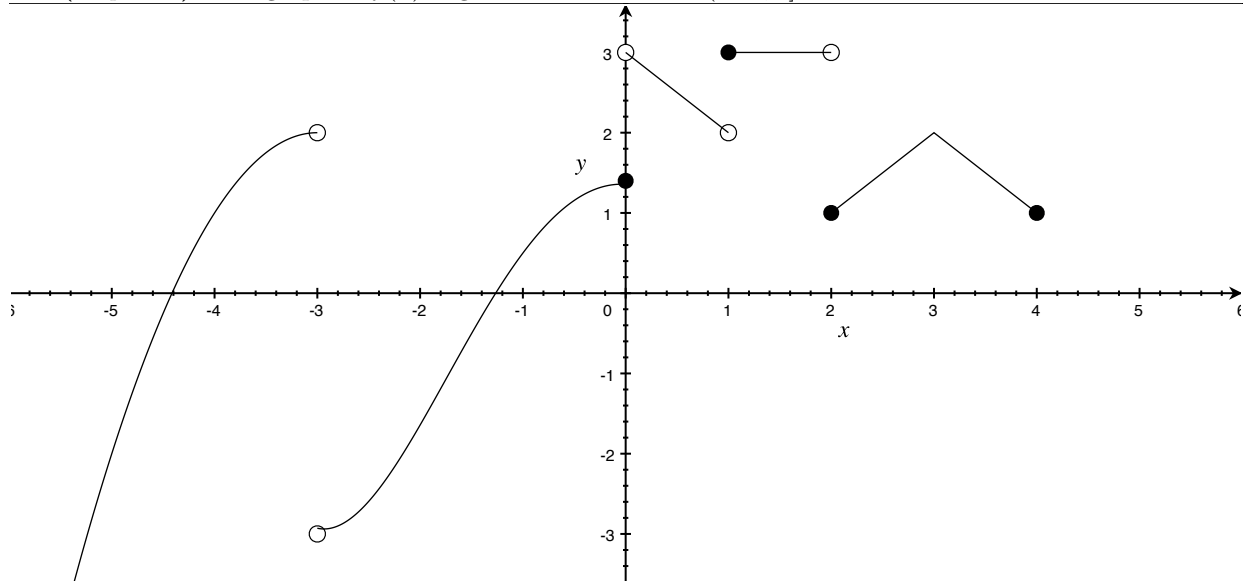
a. (7 pts) Find constants a and b such that the polynomial $p(x) = x^3 + ax + b$ is increasing for $x < 1$ and decreasing for $x > 1$ but $p(1) = -3$.

b. (5 pts) Is $y = 2x^5$ a solution to the IVP $y' = \frac{10y}{x}, y(1) = 2$. Justify your answer.

c. (6 pts) Solve the following differential equation with initial conditions $y(0) = 2$ and $y'(0) = 4$

$$y'' = 2x$$

5. (19 points) The graph of $f(x)$ is given on the interval $(-\infty, 4]$.



a. (2 pts) $\lim_{x \rightarrow -3^-} f(x) =$

b. (2 pts) $\lim_{x \rightarrow -3^+} f(x) =$

c. (2 pts) $f(1) =$

d. (2 pts) $\lim_{x \rightarrow 1} f(x) =$

e. (2 pts) $\lim_{x \rightarrow 3} f(x) =$

f. (3 pts) Where is the function not continuous (which x -values)?

g. (2 pts) Where is the function not differentiable (which x -values)?

h. (4 pts) What is the range of the function?

6. (8 points) Solve the following limit in **two** ways. One of the ways must be through algebraic manipulation. Show your work for both ways.

$$\lim_{x \rightarrow 0} \frac{\frac{2}{1+x} - 2}{x}$$