Name:_____

Exam 1 - Math 105D

Show all your work to receive full credit for a problem. There are a total of 72 points on this test.

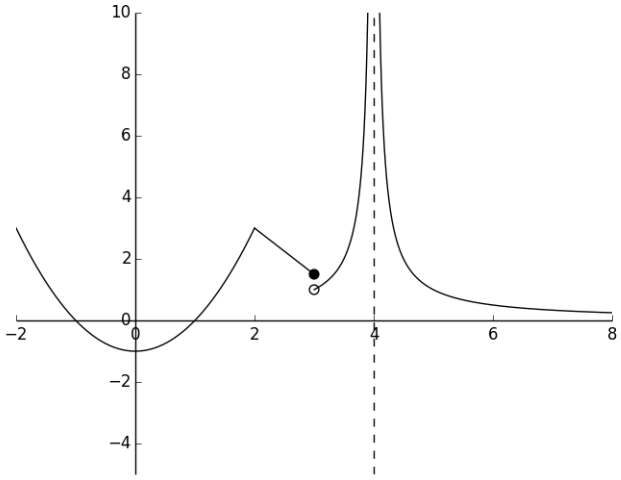
1. (6 pts) Find the equation of the line tangent to the graph of f at $(1, 1)$, where f is given by $f(x) = 2x^3 - 2x^2 + 1$.

2. (6 pts) The function below describes the velocity of a moving body at time t:

$$v(t) = 6t^2 + 4t$$

If the body has moved 10 units of distance in $t = 2$ seconds, what function describes the position of the body at time t?

3. Below is the graph of a function g.



(a) (3 pts) Evaluate $\lim_{x \to -1} g(x)$

(b) (3 pts) Evaluate $\lim_{x \to 4} g(x)$

(c) (3 pts) Is the function continuous at $x = 2$? Justify your answer (your answer should make reference to limits, not just features of the graph).

(d) (3 pts) Is the function differentiable at $x = 2$? Justify your answer.

4. (4 pts each, 16 points total.) The table below contains values of $H(x)$ in the interval $[0, 1]$.

x	$H(x)$
0	3.7
0.2	3.5
0.4	3.5
0.6	3.9
0.8	4.0
1.0	3.9

(a) Use the table to estimate the value of $H'(0.6)$.

(b) Use the table to estimate the value of $H'(0.5)$.

(c) Where do you think the maximum and minimum values of H occur in the interval $0 \leq x \leq 1$?

(d) Estimate $H''(0.6)$.

5. (4 pts) What limit must you calculate to find $f'(1)$, where $f(x) = x^{100}$? (I don't want you to calculate the limit, nor use the power rule).

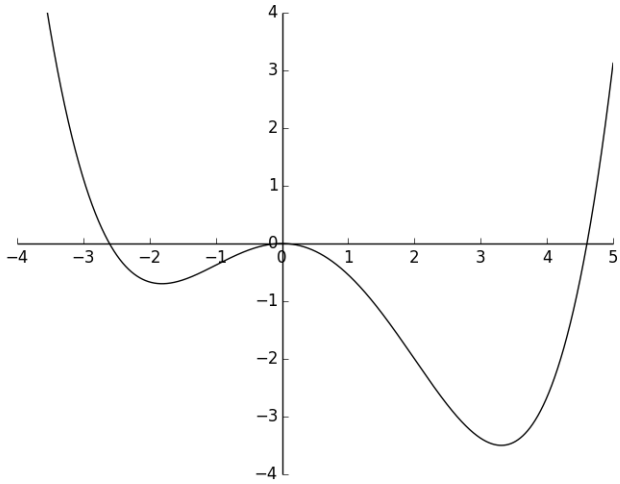
6. (4 pts each, 12 points total) Are the following statements True or False? Explain your answer through an example.

   (a) If $f'(p) = 0$, then $f(x)$ must have a local maximum or a local minimum at $x = p$.

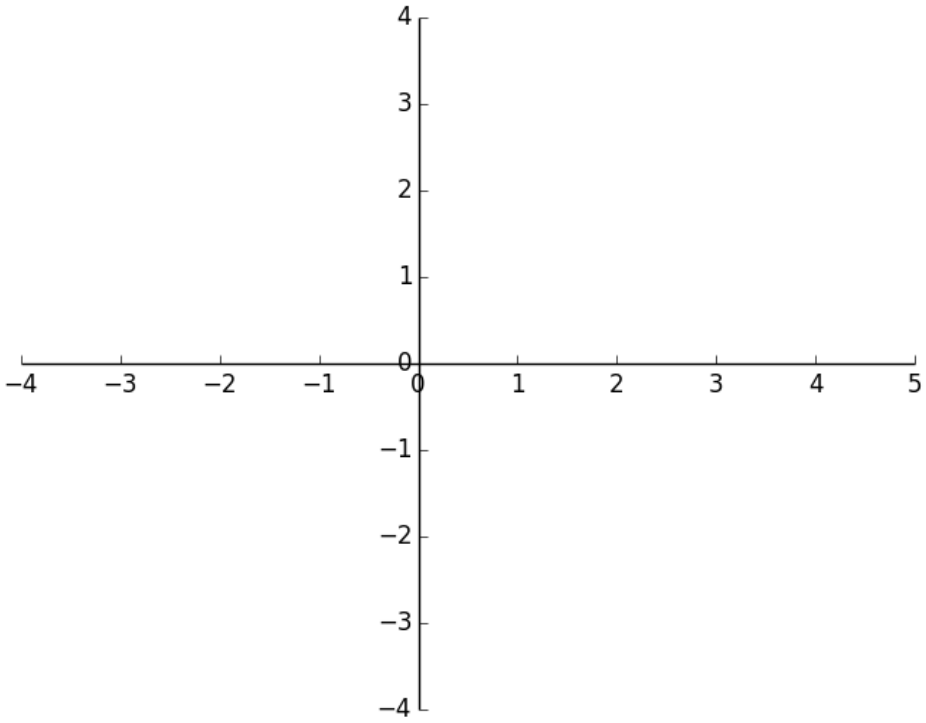
   (b) If $f(x)$ has a local minimum at $x = p$, then $f'(p) = 0$.

   (c) If $f''(x) > 0$, then $f'(x)$ is increasing.

7. (8 pts each, 16 pts total.) Let $g(x)$ be the function whose graph is shown below. (Note: This problem continues on the next page.)



(a) Use the axes below to draw a graph of $g'(x)$, the derivative of $g(x)$.



(b) Use the axes below to draw a graph of $G(x)$, an antiderivative of $g(x)$.