Mathematics 141 Test #2 Name:____________________________

Show your work to get credit. An answer with no work will not get credit.

(1) (15 points) Compute the following derivatives. You do not have to simplify your answers.

(a) $y = 5x^{4/3} + \sqrt{x}$

$y' =$

(b) $A(\theta) = \sqrt{2 + \sin(3\theta)}$

$A'(\theta) =$

(c) $D_t \dfrac{t}{\sqrt{1+t^2}} =$

(2) (5points) Commute the first three derivatives of $f(x) = 5x^4 - 7x^3 + 3x^2 - 11x + 23$.

$f'(x) =$

$f''(x) =$

$f'''(x) =$

(3) (5 points) If A and r are related by

$$A^3 - 4A^2r + Ar^2 = 3$$

then find $\dfrac{dA}{dr}$ by implicit differentiation.

$\dfrac{dA}{dr} =$ ______________________

(4) (10 points) Find the tangent line to $x^2y^2 + 4xy = 12y$ at the point $(2, 1)$.

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(5) (10 points) A spherical snow ball melts at a rate of $1/2\text{in}^3$ per minute. Assuming that it stays spherical as it melts, then how fast is its radius changing when the radius is 1in.

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(6) (10 points) Define or state the following:

(a) The $f(c)$ is the maximum of f on the interval $[a, b]$.

(b) c is a stationary point of f.

(c) c is a singular point of f.

(d) c is a critical point of f on $[a, b]$.

(e) The critical point theorem.

(7) (15 points) For the function $f(x) = x^3 - 12x + 7$ on $[-3, 4]$, find the critical points and the maximum and minimum. $f(x) = x^3 - 12x + 7$ on $[-3, 4]$.

Critical Points: ____________________

Maximum ____________________

Minimum ____________________

(8) (10 points) A farmer has 100 feet of fencing and wishes to make an enclosure with two pens and one side along along a barn as shown in figure **??**. What are the dimensions that give the largest total area for the pens?

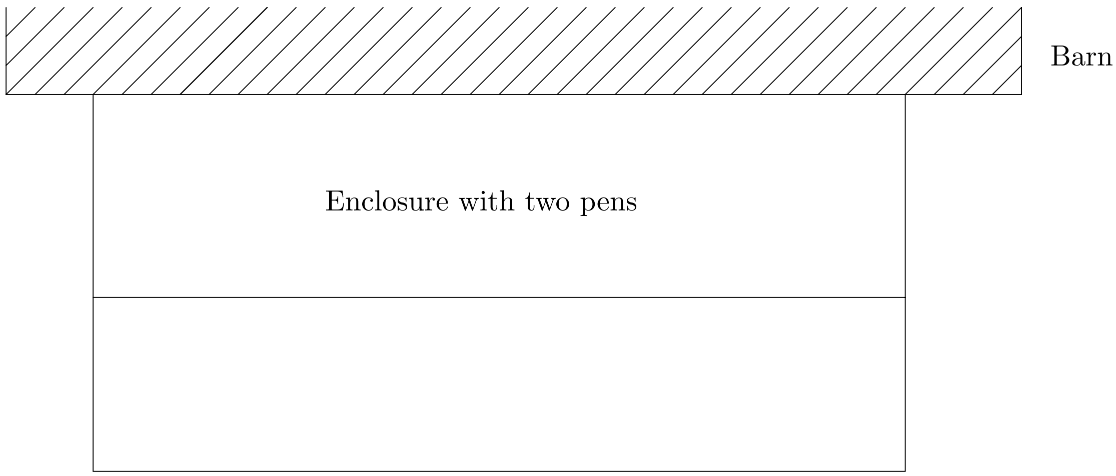

FIGURE 1. One side is along the barn.

(9) For the following functions find where they are increasing and decreasing.

(a) $f(x) = 5 + 4x - x^2$

Increasing ____________________

Decreasing ____________________

(b) $f(x) = 3x^3 - 36x$

Increasing ____________________

Decreasing ____________________