MATH 165   EXAM 1   Spring,

Last Name _____ First Name _____ SSN _____

- Write your TA's name and discussion time on the front page of the exam booklet.

- Write all your work on the booklet and turn in this sheet with your booklet.

- Calculator is allowed but cannot be shared.

- Put a box around your answer and show your work for partial credit.

1. **(15 pts.)**   Given that $f(x) = \begin{cases} -4 & \text{if } x < 0 \\ x - 4 & \text{if } 2 > x \geq 0 \\ 3 - 2x^2 & \text{if } x \geq 2 \end{cases}$

   Which of the following statements are true? Write your answer on the booklet.

   T F (a) $\lim_{x \to 0} f(x) = -4$

   T F (b) $f(x)$ is continuous at $x = 0$

   T F (c) $\lim_{x \to 2} f(x) = -2$

   T F (d) $f(2)$ does not exist

   T F (e) $\lim_{x \to -\infty} f(x) = -4$

2. **(20 pts.)**   Find $f'(x)$ for $f(x) = x^2 - 2x$ by using the definition of the derivative.

3. **(15 pts.)**   Find an equation of the line tangent to the curve $f(x) = \dfrac{x^2 - 3x + 2}{2x^2 - 1}$ at $x = 0$.

4. **(15 pts.)**   If $f(x) = x^2 - 3x + 5$

   (a) Use calculus to estimate the change in f if x changes from 4 to 6.

   (b) Estimate the percentage change in f if x changes from 4 to 6.

5. **(15 pts.)** A manufacturer's total cost is $C(q) = 0.1q^3 - 0.5q^2 + 500q + 200$ dollars, where q is the number of units produced.

(a) Use marginal analysis to estimate the cost of manufacturing the 4th unit.

(b) Compute the actual cost of manufacturing the 4th unit.

6. **(20 pts each)** Find the derivative of the function. DO NOT simplify.

(a) $f(x) = (4x + 1)^9 \cdot \sqrt[3]{(1 - 3x)^5}$

(b) $xy^3 = 3y + 2x$, **find** $\dfrac{dy}{dx}$.