MATH 151, FALL 2009
COMMON EXAM I - VERSION A

LAST NAME, First name (print): _____

INSTRUCTOR: _____

SECTION NUMBER: _____

UIN: _____

SEAT NUMBER: _____

DIRECTIONS:

1. The use of a calculator, laptop or computer is prohibited.
2. In Part 1 (Problems 1-10), mark the correct choice on your ScanTron using a No. 2 pencil. *For your own records, also record your choices on your exam!*
3. In Part 2 (Problems 11-15), present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate your final answer.* You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.
4. Be sure to *write your name, section number and version letter of the exam on the ScanTron form.*

THE AGGIE CODE OF HONOR

"An Aggie does not lie, cheat or steal, or tolerate those who do."

Signature: _____

DO NOT WRITE BELOW!

Question	Points Awarded	Points
1-10		50
11		10
12		10
13		10
14		10
15		10
		100

PART I: Multiple Choice

1. (5 pts) Find a unit vector perpendicular to the line described by the parametric equations $x = 2t + 1$, $y = -3t + 5$.

   (a) $\left\langle \frac{3}{\sqrt{13}}, \frac{2}{\sqrt{13}} \right\rangle$

   (b) $\left\langle -\frac{1}{\sqrt{5}}, \frac{1}{\sqrt{5}} \right\rangle$

   (c) $\langle 3, 2 \rangle$

   (d) $\left\langle \frac{2}{\sqrt{13}}, -\frac{3}{\sqrt{13}} \right\rangle$

   (e) $\langle 2, -3 \rangle$

2. (5 pts) $\lim_{x \to 0} \frac{\sqrt{9 - x} - 3}{x} =$

   (a) $\frac{1}{6}$

   (b) 0

   (c) 1

   (d) $-\frac{1}{6}$

   (e) The limit does not exist.

3. (5 pts) If $H(x) = x^2 f(x)$, find $H'(-2)$ if it is known that $f(-2) = 3$ and $f'(-2) = -4$.

   (a) 16

   (b) -12

   (c) 4

   (d) -22

   (e) -28

4. (5 pts) A wagon is pulled a distance of 25 feet along a horizontal path by a constant force of 8 pounds. The handle of the wagon is at an angle of 60° above the horizontal. How much work is done?

   (a) $100\sqrt{3}$ foot pounds
   (b) $100\sqrt{2}$ foot pounds
   (c) 200 foot pounds
   (d) 100 foot pounds
   (e) $200\sqrt{3}$ foot pounds

5. (5 pts) Find the equation of the tangent line to the graph of $f(x) = \dfrac{x}{1+x}$ at $x = 2$.

   (a) $y - \dfrac{2}{3} = \dfrac{5}{9}(x-2)$
   (b) $y - \dfrac{2}{3} = \dfrac{1}{9}(x-2)$
   (c) $y - \dfrac{2}{3} = -\dfrac{1}{9}(x-2)$
   (d) $y = \dfrac{1}{9}(x-2)$
   (e) $y - \dfrac{5}{9} = \dfrac{5}{9}(x-2)$

6. (5 pts) Which of the following is a cartesian equation for the curve described by the parametric equations $x = \sin t$, $y = 4 + \cos t$, $0 \le t \le 2\pi$?

   (a) $x^2 + y^2 = 1$
   (b) $(x-4)^2 + y^2 = 1$
   (c) $x^2 + (y-4)^2 = 1$
   (d) $(x-4)^2 - y^2 = 1$
   (e) $x^2 - (y-4)^2 = 1$

7. (5 pts) Where is $f(x) = \begin{cases} 2x+1 & \text{if } x \leq -1 \\ x^2 - 3 & \text{if } -1 < x \leq 2 \\ \frac{1}{x} + \frac{1}{2} & \text{if } x > 2 \end{cases}$ not continuous?

(a) $x = 2$
(b) $x = -1$
(c) $x = -1$ and $x = 2$
(d) $x = 0$, $x = -1$ and $x = 2$
(e) $x = 0$ and $x = -1$

8. (5 pts) $\lim_{x \to -3^+} \frac{x-1}{x^2(x+3)} =$

(a) $\frac{1}{3}$
(b) $-\infty$
(c) ∞
(d) $-\frac{1}{3}$
(e) 0

9. (5 pts) Which of the following intervals contains a solution to the equation $x^3 + 3x = x^2 + 1$?

(a) $(-1, 0)$
(b) $(-2, -1)$
(c) $(1, 2)$
(d) $(0, 1)$
(e) $(2, 3)$

10. (5 pts) Where is $f(x) = |x^2 - 16|$ not differentiable?

(a) $x = 0$
(b) $x = 8$
(c) $x = \pm 4$
(d) $x = 0$, $x = \pm 4$
(e) $f(x)$ is differentiable everywhere because it is a polynomial.

PART II WORK OUT

Directions: Present your solutions in the space provided. *Show all your work* neatly and concisely and *Box your final answer*. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.

11. (10 pts) Find $\lim_{x \to -\infty} \left(x + \sqrt{x^2 + 3x}\right)$.

12. (10 pts total)

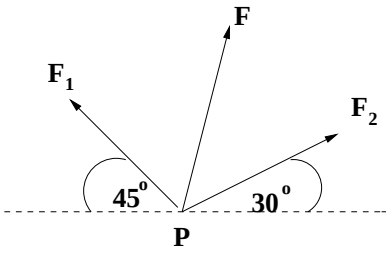
(i) (4 pts) Find the cosine of the angle between the vectors $\langle 1, 4\rangle$ and $\langle 2, 3\rangle$.

(i) (3 pts) Find the scalar projection of $\langle 1, 4\rangle$ onto $\langle 2, 3\rangle$.

(ii) (3 pts) Find the vector projection of $\langle 1, 4\rangle$ onto $\langle 2, 3\rangle$.

13. (10 pts) Using the *definition of the derivative*, find $f'(x)$ for $f(x) = \dfrac{2}{x-3}$.

14. (10 pts) Two forces $\mathbf{F_1}$ and $\mathbf{F_2}$ with magnitudes 8 and 10 pounds respectively act on an object at a point P as shown. Find the magnitude of the resultant force $\mathbf{F}$ acting on the object. Do not simplify.



15. (a) (5 pts) Find $\lim_{x \to 2^-} \dfrac{x-2}{|x-2|}$

(b) (5 pts) Is there a value of a for which $\lim_{x \to 1} \dfrac{3x^2 + ax + a + 3}{x^2 + x - 2}$ exists? If so, find the value of a. If not, explain why.

End of Exam