

## MATH 251 (Fall 2010) Diagnostic Quiz

This quiz does not count towards your grade. **Show all work!** Write your solutions on *another* sheet of paper.

(1) Let  $f(x) = x^2$ .

(a) Compute  $f'(3)$

(b) What is the limit definition of  $f'(3)$ ?

(c) What does  $f'(3)$  mean geometrically?

(2) Find (a)  $\int_{1/2}^2 \frac{1}{x} dx$

(b)  $\int_0^\infty xe^{-x^2} dx$

(3) On what intervals is  $f(x) = 2x^3 + 3x^2 - 12x$  increasing? Also, find the absolute maximum of  $f$  on the interval  $0 \leq x \leq 3$ .

(4) State two versions of the Fundamental Theorem of Calculus.

(5) Let  $f(x) = \int_5^x \sin(t^3) dt$ . What is  $f'(10)$ ?

(6) Use two triangles and a circle to work out:  $\cos \pi/6$ ,  $\sin \pi$ ,  $\tan \pi/4$ ,  $\cot \pi/3$ .

(7) Compute the equation of the tangent line to  $y = \cos(x^2)$  at  $x = \pi/3$ .

(8) Graph (a)  $2x + 5y = 1$ , (b)  $y = x^2 - 2x + 3$ , (c)  $y^2 - 9x^2 = 4$ ,

(d)  $16y^2 + 9x^2 = 1$ .