

STUDENT'S NAME: _____ ID #: _____

DEPARTMENT OF MATHEMATICS & STATISTICS

MATH 1003

MID-TERM TEST

WEDNESDAY, OCTOBER 25, 2006

TOTAL: 55

TIME: 1½ HOURS

Closed book, no notes, calculators, etc.

Do all your work in the space provided. If you need more space, use the back of the page.

MARKS

1. Consider the function $f(x) = \frac{x}{\sqrt{4-x^2}}$.

(5) (a) Find its domain.

(5) (b) Find the vertical asymptotes, if there are such. Give a reason for your answer.

2. Consider the piecewise function $f(x) = \begin{cases} -x^2 + 1 & \text{if } x < 1 \\ x - 1 & \text{if } x > 1 \\ -2 & \text{if } x = 1 \end{cases}$

(5) (a) Sketch the graph $y = f(x)$.

(5) (b) Is $f(x)$ continuous at $x = 1$? Explain your answer, using the definition of continuity.

- (6) 3. Compute the derivative of $g(t) = \frac{t-1}{t}$ at $t = 1$, using the limit definition of the derivative.

4. Use the rules of differentiation to compute the derivatives of the following functions. Do not simplify.

(5) (a) $f(x) = \frac{1-x}{1+2x}$

(5) (b) $y = (x^2 + 4)(x + 3)$

(5) (c) $u(r) = \sqrt{1 - 2 \sin r}$

(7) 5. Find the equation of the tangent line to the curve $y = x\sqrt{1+x}$ at $x = 3$.

(7) 6. Use the rules of differentiation and the fact that $\frac{d}{dx} \sin x = \cos x$ to **prove** that $\frac{d}{dx} \csc x = -\csc x \cot x$.