

ID Check _____

Time Started KEY

Name _____

Section/Professor _____

MAT 136: CALCULUS I
GATEWAY EXAM - VERSION D

Full Pass requires 7 or 8 problems; Half Pass 5 or 6. No partial credit

NO CALCULATOR OR SCRATCH PAPER

BOX FINAL ANSWERS

In each case, find the derivative of the given function. It is not necessary to simplify the result algebraically.

$$1. f(x) = \frac{x^2 - 3x + 2}{x^2 + 2} \quad f'(x) = \frac{(x^2 + 2)(2x - 3) - (x^2 - 3x + 2)(2x)}{(x^2 + 2)^2}$$

$$2. f(x) = e^{\cos(x)} \cos(x) \quad f'(x) = (e^{\cos x})(-\sin x) + (\cos x)(e^{\cos x})(-\sin x) \\ = -\sin x e^{\cos x} (\cos x + 1)$$

$$3. g(x) = \ln(\tan(x)) \quad g'(x) = \frac{1}{\tan x} \cdot \sec^2 x = \frac{\cos x}{\sin x} \cdot \frac{1}{\cos^2 x} = \frac{1}{\sin x \cos x}$$

$$4. f(t) = \frac{t^{3/2} - t + t^{1/2}}{\sqrt{t^3}} = \frac{t^{3/2} - t + t^{1/2}}{t^{3/2}} = 1 - t^{-1/2} + t^{-1}$$

$$f'(t) = \frac{1}{2} t^{-3/2} - t^{-2} = \frac{1}{2t^{3/2}} - \frac{1}{t^2}$$

5. $f(x) = \sin(\ln(x^2 + 1))$

$$f'(x) = \cos(\ln(x^2 + 1)) \cdot \frac{1}{x^2 + 1} \cdot 2x$$
$$= \frac{2x \cos(\ln(x^2 + 1))}{x^2 + 1}$$

6. $f(x) = \arctan(x^2)$

$$f'(x) = \frac{1}{1 + x^4} \cdot 2x = \frac{2x}{1 + x^4}$$

7. $g(t) = e^{e^{t^2}}$

$$g'(t) = e^{e^{t^2}} \cdot e^{t^2} \cdot 2t = 2te^{t^2}e^{e^{t^2}}$$
$$= 2te^{t^2 + e^{t^2}}$$

8. $f(t) = 4^t \cos(4t)$

$$f'(t) = 4^t (-\sin(4t)) \cdot 4 + \cos(4t) \cdot 4^t \cdot \ln 4$$

$$= (\ln 4)(4^t) \cos(4t) - 4 \sin(4t) \cdot 4^t$$