

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 1

Question 1. Find the following derivatives:

(a) (1 mark) $\frac{d}{dx}(\cot x) = -\csc^2 x$

(b) (1 mark) $\frac{d}{dx}(\log_7 x) = \frac{1}{x \ln 7}$

(c) (1 mark) $\frac{d}{dx}(\csc^{-1} x) = -\frac{1}{x\sqrt{x^2-1}}$

(d) (2 marks) $\frac{d}{d\theta}(\arctan(\cos \theta)) = \frac{1}{1+\cos^2 \theta} (-\sin \theta)$

Question 2. Find the following antiderivatives:

(a) (1 mark) $\int \frac{1}{x\sqrt{x^2-1}} dx = \operatorname{arcsec} x + C$

(b) (1 mark) $\int \csc x \cot x dx = -\csc x + C$

Question 3. (3 marks) Solve for f given $f''(x) = x^{-2}$, $f(1) = 0$ and $f(2) = 0$.

$$f'(x) = \int f''(x) dx = \int x^{-2} dx = -x^{-1} + C$$

$$f(x) = \int f'(x) dx = \int -x^{-1} + C dx = -\ln|x| + Cx + D$$

$$f(1) = 0 = -\ln|1| + C + D \Rightarrow C + D = 0 \Rightarrow C = -D$$

$$f(2) = 0 = -\ln 2 + 2C + D \Rightarrow -\ln 2 + 2C - C = 0$$

$$C = \ln 2 \Rightarrow D = -\ln 2$$

$$\therefore f(x) = -\ln|x| + x \ln 2 - \ln 2$$