MTH112 – TEST 2

Name: _____

HONOR CODE: On my honor, I have neither given nor received any aid on this exami-
nation.

Signature: _____

Note: Show all work on exam in order to receive full credit.

1. Find the limit.

   (a) $\displaystyle \lim_{x \to \infty} \frac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}}$

   (b) $\displaystyle \lim_{x \to \infty} \left[\ln(2 + x) - \ln(1 + x) \right]$

   (c) $\displaystyle \lim_{x \to 0^+} (\cot x)^{\sin x}$

   (d) $\displaystyle \lim_{x \to \infty} \left(x - \sqrt{x^2 - 1} \right)$

2. Find the exact value of

   (a) $\cos\left(2\sin^{-1}\frac{5}{13}\right)$

   (b) $\sec\left(\arctan 2\right)$

3. Let $f(x) = \dfrac{\ln x}{x}$. (Note: You must formally do all steps.)

   (a) Find the domain of f.

   (b) Find the asymptotes of f.

   (c) Find the critical points of f, and the intervals on which the function is increasing, decreasing.

(d) Find the inflection points of f, and the intervals on which the function is decreasing, increasing.

(e) Sketch the graph of f.

4. Using Integration by Parts, evaluate the following integrals.

(a) $\int t^2 \ln t \ dt$

(b) $\int_0^{\pi/2} x \cos 2x \ dx$

(c) $\displaystyle\int \cos x \ln(\sin x)\ dx$

(d) $\displaystyle\int \sin(\sqrt{x})\ dx$. (Hint: First make a substitution, then use integration by parts.)

5. Evaluate the trigonometric integrals.

(a) $\displaystyle\int_0^{\pi/4} \sin^4 x \cos^2 x dx$

(b) $\displaystyle\int \tan^2 x \; dx$

(c) $\displaystyle\int \tan x \sec^3 x \; dx$

(d) $\displaystyle\int \sin 5x \sin 2x \; dx$

(e) $\displaystyle\int_0^\pi \sin^2 x \; dx$