

# MAT 131

# FALL 2012

# Practice Final

NAME :

ID :

RECITATION NUMBER:

THERE ARE TEN (10) PROBLEMS. THEY HAVE THE INDICATED VALUE.

SHOW YOUR WORK

DO NOT TEAR-OFF ANY PAGE

NO CALCULATORS NO CELLS ETC.

ON YOUR DESK: ONLY test, pen, pencil, eraser.

1		30pts
2		30pts
3		30pts
4		30pts
5		30pts
6		30pts
7		30pts
8		30pts
9		30pts
10		30pts
Total		300pts

**!!! WRITE YOUR NAME, STUDENT ID AND LECTURE N. BELOW !!!**

NAME :

ID :

LECTURE N.

**1. (30pts)**

For each of the following functions, find its domain and range, then draw its graph.

**a.**  $y = x^2 - x$ .

**b.**  $y = \sqrt{2x - x^2}$ .

**c.**  $y = \cos(2x) - 1$ .

**2. (30pts)**

Suppose  $\cos \theta = \frac{2}{7}$  and  $-\frac{\pi}{2} < \theta < 0$ . Find the values of the  $\sin \theta$ ,  $\tan \theta$ ,  $\sec \theta$ ,  $\cot \theta$  and  $\csc \theta$ .

**3. (30pts)**

(a) State the product law for limits.

(b) If

$$\lim_{x \rightarrow 0} \frac{f(x)}{x^2} = 1,$$

then what is

$$\lim_{x \rightarrow 0} f(x)?$$

(c) If

$$x + 1 \leq f(x) \leq e^x$$

for all  $x$ . Find  $\lim_{x \rightarrow 0} f(x)$ , stating any results you use.

**4. (30pts)**

Plot the graph of a function satisfying the following:  $f(0) = 0$ ,  $\lim_{x \rightarrow 2} f(x) = \infty$ ,  $\lim_{x \rightarrow 1^-} f(x) = -\infty$ ,  $\lim_{x \rightarrow 1^+} f(x) = 0$ ,  $\lim_{x \rightarrow \infty} f(x) = \infty$ ,  $\lim_{x \rightarrow -\infty} f(x) = 0$ .

**5. (30pts)**

Differentiate the following functions.

(a)  $\frac{e^x - e^{-x}}{e^x + e^{-x}}$ .

(b)  $\sin(\sqrt{x^2 + 1})$ .

(c)  $x^{\tan x}$ .

**6. (30pts)**

Let the curve  $C$  be given by the implicit equation

$$x^2 + y^2 = (2x^2 + 2y^2 - x)^2.$$

Find the tangent to the curve  $C$  at the point  $(x, y) = (0, -\frac{1}{2})$ .

**7. (30pts)**

A particle is moving along the curve  $xy = 1$ . As the particle passes through the point  $(\frac{\sqrt{3}}{2}, \frac{2}{\sqrt{3}})$ , its  $y$ -coordinate increases at a rate of  $2\text{cm/s}$ .

(a) What's the rate of change of  $x$ -coordinate at this instant?

(b) How fast is the distance from the particle to the origin changing at this instant?



**8. (30pts)**

Compute the following limits.

(a)  $\lim_{t \rightarrow 0} \frac{\sin 3t}{\tan 6t}$

(b)  $\lim_{x \rightarrow \infty} (\sqrt{x+1} - \sqrt{x})$

(c)  $\lim_{x \rightarrow \infty} x^{\frac{1}{x}}$

**9. (30pts)**

Evaluate

**(a)**

$$\int_1^{\sqrt{3}} \frac{d}{dx} (\ln(\tan^{-1} x)) dx$$

**(b)**

$$\frac{d}{dx} \int_{x^2}^{\sqrt{3}} \ln(\tan^{-1} t) dt.$$

**10. (30pts)**

Evaluate the following definite and indefinite integrals

(a)

$$\int_0^{\pi} |\cos x| dx.$$

(b)

$$\int_{-1}^1 \frac{\sin(3x)}{1+x^2} dx.$$

(c)

$$\int \frac{\sin(2x)}{1+\sin^2 x} dx.$$

## Scrap Paper