<b>1</b> :

## Math 105 TOPICS IN MATHEMATICS

## FINAL EXAM (Take-home)

May 6 (Wed), 2015

Seat #:

Instructor: Yasuyuki Kachi

Line #: 52920.

ID # :

 $\underline{Name}:$ 

This take-home part of Final Exam is worth 80 points and <u>is</u> <u>due in class Friday, May 15th, 2015. Submission after 10:00 am,</u> May 15th will not be accepted.

• Be sure to write your answers neatly, precisely, and with complete sentences. You may use notes and handed out materials, but no outside help.

• Print off one entire set of this exam. Write answers in the printed sheets. You may not supply your own (blank) sheet.

[I] (Take-home; 12pts) Convert each of the following expression of numbers in the binary system back into the usual decimal system.

(a) 101. (b) 11000. (c) 11111111 (eight straight 1s).

[<u>Answers</u>]: (a) (b) (c)

[II] (Take-home; 8pts) Agree

$$e^2 = 1 + \frac{1}{1!} \cdot 2 + \frac{1}{2!} \cdot 2^2 + \frac{1}{3!} \cdot 2^3 + \frac{1}{4!} \cdot 2^4 + \frac{1}{5!} \cdot 2^5 + \cdots$$

Mimic this and write out the following quantity exactly in this format.

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([II] continued)

 $e^{\pi} =$ 

[III] (Take-home; 12pts) Expand

(1) 
$$x^4 \left(x^4 + x^2 + 1\right) =$$

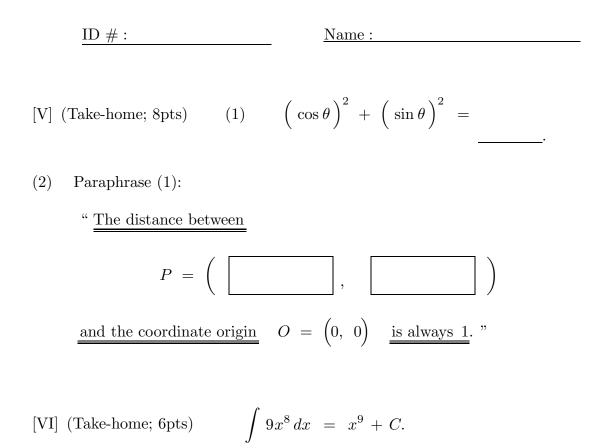
$$(2) \quad \left(x+1\right)\left(x+6\right) =$$

(3) 
$$(x-1)(x^6+x^5+x^4+x^3+x^2+x+1) =$$

- [IV] (Take-home; 8pts) Find
- (1)  $\frac{d}{dx}x^{10} =$

=

(2) 
$$\frac{d}{dx}\left(1+\frac{1}{1!}x+\frac{1}{2!}x^2+\frac{1}{3!}x^3+\frac{1}{4!}x^4+\frac{1}{5!}x^5+\frac{1}{6!}x^6+\frac{1}{7!}x^7\right)$$



This means

[VII] (Take-home; 6pts)  $(\underline{\text{Do not forget } + C})$ 

(1) 
$$\int 6x^5 dx =$$
 (2)  $\int x^{11} dx =$ 

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[VIII] (Take-home; 8pts)

 $(1) \quad \sin\left(x+y\right) \quad = \quad$ 

(in terms of  $\sin x$ ,  $\cos x$ ,  $\sin y$  and  $\cos y$ ).

$$(2) \quad \cos\left(x+y\right) =$$

(in terms of  $\sin x$ ,  $\cos x$ ,  $\sin y$  and  $\cos y$ ).

[IX] (Take-home; 6pts)

(1)  $\int \cos x \, dx =$ \_\_\_\_\_, (2)  $\int \sin x \, dx =$ \_\_\_\_\_,

[X] (Take-home; 6pts)

