

FINAL EXAM  
Mathemattics 1320 and 1420  
Tuesday, December 13, from 10:30am - 1:00pm

Follow the instructions given to you by your instructor. The test consists of 20 multiple choice problems and 4 problems to be worked out completely.

- (1) Determine whether the function,  $f(x) = 2^x + 2^{-x}$  is odd, even or neither.
- (a) Even
  - (b) Odd
  - (c) Neither odd nor even
  - (d) even and odd
  - (e) None of the above

- (2) Find the equation of the line passing through the two points  $(-2, -4)$  and  $(1, -1)$
- (a)  $y = x + 2$
  - (b)  $y = -x - 2$
  - (c)  $y = -x + 2$
  - (d)  $y - x + 2 = 0$
  - (e)  $y = 2x + 1$

- (3) Perform the indicated operation and write the result in standard form.

$$\frac{1+2i}{1-2i} + \frac{1-i}{1+2i}$$

- (a)  $\frac{-4+i}{5}$
- (b)  $\frac{2+i}{5}$
- (c)  $\frac{-4+i}{3}$
- (d)  $\frac{-4+4i}{3}$
- (e) None of the above

- (4) Solve the following rational equation:

$$\frac{3}{x+2} + \frac{2}{x-2} = \frac{8}{(x+2)(x-2)}$$

The solution of this equation is:

- (a)  $\{-2, 2\}$
  - (b)  $\{2\}$
  - (c)  $\{-1\}$
  - (d)  $\emptyset$
- (5) Solve the following absolute value inequality and use interval notation to express the solution set.

$$1 < |x - 1| < 2$$

- (a)  $(-1, 3)$
- (b)  $(0, \infty)$
- (c)  $(0, 3)$
- (d) none of the above

- (6) Write an equation of the line passing through  $(5, -9)$  and perpendicular to the line whose equation is  $x + 7y - 12 = 0$ .
- $y = 7x - 44$
  - $y = 7x - 26$
  - $y = -\frac{1}{7} + 9$
  - $y = -7x + 44$
- (7) Solve the exponential equation  $e^{x+5} = 2$ .
- $\ln 2 - 5$
  - $e^2 + 5$
  - $e^{10}$
  - $\ln 7$
- (8) Give the domain and the range of the relation  $\{(-4, -10), (-2, -5), (0, 5), (2, 10), (4, 15)\}$
- domain:  $\{-4, -2, 0, 2, 4\}$ ; range:  $\{-10, -5, 5, 10, 15\}$
  - domain:  $\{-4, -5, 0, 10, 4\}$ ; range:  $\{10, 5, 4, 15, -2\}$
  - domain:  $\{10, 5, 1, 15, 4\}$ ; range:  $\{-4, -2, 0, 2, 4\}$
  - domain:  $\{-10, -5, 5, 10, 15\}$ ; range:  $\{-4, -2, 0, 2, 4\}$

- (9) The partial fraction decomposition of  $\frac{11x - 35}{(x - 1)(x - 4)}$  is

- $\frac{3}{x - 1} + \frac{1}{x - 4}$
- $\frac{-3}{x - 2} + \frac{-3}{x - 4}$
- $\frac{3}{x - 1} + \frac{2}{x - 4}$
- $\frac{8}{x - 1} + \frac{3}{x - 4}$

- (10) Determine which given ordered pair is a solution of the system.

$$\begin{cases} x + 3y = 11 \\ x - 5y = -13 \end{cases}$$

- $(2, 3)$
  - $(2, 4)$
  - $(3, 3)$
  - $(3, 4)$
  - $(4, 3)$
- (11) Condense the logarithmic expression into a single logarithm whose coefficient is 1.

$$3 \ln x - \frac{1}{3} \ln y$$

- $\ln(x^3 y^3)$
- $\ln\left(\frac{x^3}{\sqrt[3]{y}}\right)$
- $\ln\left(\frac{x^3}{y^3}\right)$
- $\ln(x^3 \sqrt[3]{y})$
- None of the above

(12) Solve:  $5x^2 + x - 2 = 0$

(a)  $\frac{-1 \pm \sqrt{41}}{10}$

(b)  $\frac{-1 \pm \sqrt{41}}{2}$

(c)  $\frac{1 \pm \sqrt{-39}}{10}$

(d)  $\frac{-1 \pm \sqrt{-39}}{5}$

(e)  $\frac{-5 \pm \sqrt{-39}}{5}$

(13) The length of a rectangular sign is 3 feet longer than the width. If the sign's area is 54 square feet, find its length and width.

(a)  $l = 6, w = 9$

(b)  $l = 18, w = 3$

(c)  $l = 9, w = 6$

(d)  $l = 27, w = 2$

(14) Find an equation for  $f^{-1}(x)$ , the inverse function, for

$$f(x) = \frac{2x + 1}{x - 3}$$

(a)  $\frac{x-2}{3x+1}$

(b)  $\frac{3x+1}{x-2}$

(c)  $\frac{x-3}{2x+1}$

(d)  $\frac{2x-3}{x-1}$

(15) Determine asymptotes of the rational function  $f(x) = \frac{3x^2+2x-1}{x^2-36}$ .

(a) Vertical asymptote:  $x = 6, x = -6$ ; horizontal asymptote: none.

(b) Vertical asymptote:  $x = 6, x = -6$ ; horizontal asymptote:  $y = 3$ .

(c) Vertical asymptote: none; horizontal asymptote:  $y = 6, y = -6$ .

(d) Vertical asymptote:  $x = 3$ ; horizontal asymptote:  $y = 6, y = -6$ .

(16) For the polynomial  $f(x) = 3x^3 - 3x^5 + 7x^6 - 15 - 5x^3$ , what is the degree of  $f(x)$ ?

(a) 2

(b) 6

(c) 15

(d) 5

(17) Expand and evaluate where possible  $\log\left(\frac{x+3}{x^2}\right)$

(a)  $2 \log x - \log(x+3)$

(b)  $\log(x+3) - \log x$

(c)  $\log(x+3) - 2 \log x$

(d)  $\log(x+3) + 2 \log x$

(18)  $f(x) = x^3$  and  $h(x) = (x+2)^3 - 1$  How do we find  $h(x)$ ?

a Move  $f$  2 units right and 3 units down

b Move  $f$  2 units right and 1 unit down

c Move  $f$  2 units left and 1 unit down

d Move  $f$  2 units left and 1 units up

- (19) Write the second term of the sequence whose  $n$ th term is given

$$a_n = \frac{(-1)^n \times 2^{n^2}}{(n+1)!}$$

- (a)  $\frac{8}{3}$   
 (b)  $\frac{16}{3}$   
 (c)  $\frac{4}{3}$   
 (d)  $\frac{15}{6}$   
 (e)  $\frac{13}{6}$
- (20) A sample of 800g of lead decays to polonium according to the function given by  $A(t) = 800e^{-0.032t}$ , where  $t$  is time in years. What is the amount of the sample after 50 years (to the nearest g)?
- (a) 39g  
 (b) 117g  
 (c) 162g  
 (d) 3962g

**The following problems are to be worked out entirely.**

- (21) I invest \$1,234.97 at an annual percentage rate of 8%. How long will it take my investment to double? Remember  $P_{n+1} = (1+i)P_n$ .
- (22) Two standard 6 sided dies are rolled. The two numbers that are face up are summed. What is the probability that the sum of the two numbers is 5?
- (23) Find the sum of the following sequence

$$1 + 2^{-1} + 2^{-2} + 2^{-3} + \dots + 2^{-45}.$$

- (24) Find the tangent lines to the circle  $x^2 + y^2 = 1$  that pass through the point  $(0, 5) = (x_0, y_0)$ .