MATH 1100 FALL 2009

Common Final Exam Dec 11, 2009

Please print the following information in case your scan sheet is misplaced:

Name: _____ Instructor:_____

Student ID #: _____ Section/Time:_____

The exam consists of **40** multiple choice questions each of equal value. You may do calculations on this question booklet paper but not on the opscan sheet. Mark beside the number of the opscan sheet corresponding to the test question number in pencil only. Mark only one answer; otherwise the answer will be counted as incorrect. You are not penalized for guessing. Please make sure that your name and student ID appear on the opscan sheet in the spaces provided.

Questions begin on page 1 and be sure to check the back of each page for questions.

At the end of the examination, you MUST hand in this test booklet, your answer sheet and all scratch paper.

Formulae:

Factoring: $x^3 - a^3 = (x-a)(x^2+xa+a^2)$
$x^3 + a^3 = (x+a)(x^2-xa+a^2)$
Circle: $(x-h)^2 + (y-k)^2 = r^2$
Lines: $y - y_0 = m(x-x_0)$; $y = mx + b$
Quadratic Formula: $\dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$
Difference Quotient: $\dfrac{f(x+h)-f(x)}{h}$
Average rate of change:
of $f(x)$ on $[a,b]$: $\dfrac{f(b)-f(a)}{b-a}$
Compound Interest: $A = P(1+\dfrac{r}{n})^{nt}$
Continuous Interest: $A = Pe^{rt}$
Parabola vertex: $\left(\dfrac{-b}{2a}, f\left(\dfrac{-b}{2a}\right)\right), a \neq 0$
Annuity: $A = \dfrac{P\left[(1+\frac{r}{n})^{nt}-1\right]}{\frac{r}{n}}$
Logarithms:
$\log_b(xy) = \log_b(x) + \log_b(y)$
$\log_b(x^p) = p\log_b(x)$
$\log_b(\dfrac{x}{y}) = \log_b(x) - \log_b(y)$
$\ln x = \log_e x$
$\log_b x = \dfrac{\ln x}{\ln b} = \dfrac{\log_{10} x}{\log_{10} b}$
$\ln e^a = a = e^{\ln a}$
$\log_b b^a = a = b^{\log_b a}$
Sinking Fund: $P = \dfrac{(A)(\frac{r}{n})}{\left(\frac{r}{n}+1\right)^{nt}-1}$
Exponential Growth : $A(t) = A_0 e^{rt}$, $r > 0$
Exponential Decay : $A(t) = A_0 e^{-rt}$, $r > 0$

1. $(2x-3)^2 = ?$

(a) $4x^2+12x+6$ (b) $4x^2+12x+9$ (c) $4x^2+16x+16$ (d) $4x^2-12x+9$ (e) $4x^2+9$

2. If one simplifies the following expression $\dfrac{\dfrac{7m^{10}n^2}{2m}}{\dfrac{14m^4n^8}{8n^4}}$ one obtains

(a) $\dfrac{m^4}{2n^2}$ (b) $\dfrac{2m^5}{n^2}$ (c) $\dfrac{2m^5}{n^3}$ (d) $\dfrac{56m^5}{28n^6}$ (e) $\dfrac{28m^5}{56n^6}$

3. $\dfrac{2x}{x+3} - \dfrac{x}{3x+4} = ?$

(a) $\dfrac{5x^2+6x+5}{(x+3)(3x+4)}$ (b) $\dfrac{6x^2+6x-6}{(x+3)(3x+4)}$ (c) $\dfrac{5x^2+5x}{(x+3)(3x+4)}$ (d) $\dfrac{3x^2+6x+6}{(x+3)(3x+4)}$ (e) $\dfrac{x}{-2x-1}$

4. If one solves the inequality $7 < 3x+1 < 10$ one obtains

(a) $(2,3)$ (b) $(-4,-2)$ (c) $(1,2)$ (d) $(-3,-1)$ (e) $(3,4)$

5. Which of the following is a factor of x^2-2x-8 ?

(a) $x-8$ (b) $x+6$ (c) $x+4$ (d) $x+2$ (e) $x+8$

6. Simplify and reduce to lowest terms $\dfrac{x^3-64}{4x^2-4} \div \dfrac{x-4}{3x^2+2x-5}$

(a) x (b) $\dfrac{(x^2+16)(3x^2+2x-5)}{(4x^2-4)}$ (c) $\dfrac{(3x+5)(x^2+4x+16)}{4(x+1)}$

(d) $\dfrac{(x^2+4x+16)(3x-5)}{4(x-1)}$ (e) $\dfrac{(x^2+4x+16)(x-4)^2}{4(x-1)(x+1)(3x^2+2x-5)}$

7. If x is the solution of $2x+1=11$, and y is the solution of $-2y+7=1+y$ then $x+y$ will be

(a) 0 (b) $\frac{13}{7}$ (c) 3 (d) 7 (e) 18

8. If one solves the equation $A = \frac{1}{3}H(B+A)$ for B one obtains

(a) $B = \dfrac{AH-2A}{H}$ (b) $B = \dfrac{3A-AH}{H}$ (c) $B = \dfrac{5AH+A}{H}$ (d) $B = \dfrac{3A-2AH}{H}$ (e) $B = \dfrac{4A-HA}{H}$

9. Mark leaves UNCC at 1:00 p.m. going 50mph and Alex leaves UNCC at 3:00 p.m. going 70mph on the same highway in the same direction. At what time does Alex catch up with Mark?

(a) 9:00pm (b) 7:00pm (c) 6:00pm (d) 5:00pm (e) 8:00pm

10. If one solves $x^2 + 4x + 1 = 0$ one obtains $x =$

(a) $-2 \pm \sqrt{3}$ (b) $\frac{-2 \pm \sqrt{3}}{2}$ (c) $\frac{-2 \pm \sqrt{5}}{2}$ (d) $\frac{-2 \pm \sqrt{7}}{2}$ (e) $\frac{-2 \pm \sqrt{11}}{2}$

11. What is the distance between the points $(7, 1)$ and $(1, 4)$?

(a) $4\sqrt{3}$ (b) $2\sqrt{5}$ (c) $4\sqrt{5}$ (d) $3\sqrt{2}$ (e) $3\sqrt{5}$

12. What is the slope of the line through $(3, 12)$ and $(1, 6)$?

(a) 1 (b) 2 (c) 3 (d) 4 (e) 5

13. Which of the following is an equation of a line which is parallel to the line $3y+6x = 18$?

(a) $6y + 18x = 3$ (b) $y = -2x - 18$ (c) $y = \frac{1}{2}x$ (d) $y = -2$ (e) $3y = 6x + 18$

14. What is the equation of the line which is perpendicular to the line $3y+6x = 18$, and has y-intercept 5?

(a) $y = \frac{1}{2}x + 5$ (b) $y = 2x + 5$ (c) $3y + 6x = 5$ (d) $(y - 3) = 2(x - 5)$ (e) $y = \frac{1}{2}(x - 5)$

15. For a particular marketing firm, advertising expenditures along the x-axis and sales plotted along the y-axis results in a graph which is a straight line. Given that \$500 in advertising resulted in \$3000 in sales and \$1000 in advertising result in \$11000 in sales. For an advertising expenditure of \$1500 what dollar amount in sales are expected ?

Hint: the points (500,3000) and (1000,11000) determine a line; Find the equation of this line.

(a) \$15000 (b) \$16000 (c) \$18000 (d) \$19000 (e) \$20000

16. The center and radius of the circle $x^2 + y^2 + 6y - 4x + 9 = 0$ are

(a) center $(-2, 3)$ radius 4 (b) center $(4, -3)$ radius 2 (c) center $(-2, -3)$ radius 2
(d) center $(3, 4)$ radius 4 (e) center $(2, -3)$ radius 2

17. Let $f(x)$ be the piecewise defined function $f(x) = \begin{cases} 2x^3 + 6 & \text{for } x < 0 \\ 2x + 4 & \text{for } x \geq 0 \end{cases}$

Then $f(-2) + f(2) = ?$

(a) -4 (b) 2 (c) -2 (d) 4 (e) -6

18. Let $f(x) = \sqrt{2x + 3}$. Then the domain is

(a) $x \geq 0$ (b) $|x| \geq \frac{2}{3}$ (c) $x \geq 2$ (d) $x \geq -\frac{3}{2}$ (e) $x \geq -1$

19. If $f(x) = (x - 1)^2$ then which of the following is correct ?

(a) the range of f is $[1, \infty)$ and f is increasing on $(-\infty, 0)$
(b) the range of f is $[1, \infty)$ and f is increasing on $(0, \infty)$
(c) the range of f is $[0, \infty)$ and f is increasing on $(0, \infty)$
(d) the range of f is $[0, \infty)$ and f is increasing on $(-\infty, 0)$
(e) the range of f is $[0, \infty)$ and f is increasing on $(1, \infty)$

20. Let $f(x) = x^2 + 2x$, the difference quotient (see page 1) is

(a) $2x + h + 1$ (b) $2x + h - 1$ (c) $2x - h + 1$ (d) $2x + h + 2$ (e) $2x + 2h + 1$

21. Let $f(x) = \sqrt{x+3} + 3$. If the graph of **this** function is shifted right 4 units, then reflected about the x-axis, then the function giving this translated figure as a graph would be

(a) $-\sqrt{x + 5} - 3$ (b) $-\sqrt{x - 1} - 3$ (c) $-\sqrt{x+6} - 3$ (d) $\sqrt{x+2} + 3$ (e) $\sqrt{x+4} + 3$

22. Let $f(x) = \dfrac{4}{x - 1}$ and $g(x) = x - 1$. Then $(g \circ f)(x) = ?$

(a) 4 (b) $\dfrac{4}{x - 1} - 1$ (c) $\dfrac{4}{x - 2}$ (d) $\dfrac{4}{\frac{1}{x-1} - 1}$ (e) $\dfrac{-4x + 8}{x + 1}$

23. The vertex of the parabola $y = 3x^2 - 12x + 3$ is

(a) $(2, -8)$ (b) $(2, -5)$ (c) $(2, -9)$ (d) $(2, 0)$ (e) $(2, -1)$

24. The height of a projectile in feet after t seconds is $H(t) = -16t^2 + 176t$. How long does it take the projectile to hit the ground ? (Hint: for what $t > 0$ is Height=zero?)

(a) 9 sec (b) 12 sec (c) 10 sec (d) 11 sec (e) 13 sec

25. Which is the solution set to $|2x - 5| - 7 \geq -2$?

(a) $(-\infty, \infty)$ (b) $(-\infty, 0] \cup [5, \infty)$ (c) $(\frac{5}{2}, \infty)$ (d) $(0, 5)$ (e) $(-\infty, -1] \cup [1, \infty)$

26. Let $f(x) = \dfrac{6x^3}{(x^2-1)(2x+4)}$. Which of the following is correct?

(a) The rational function $f(x)$ has two vertical asymptotes and $y = 3$ is a horizontal asymptote.
(b) The rational function $f(x)$ has three vertical asymptotes and $y = 6$ is a horizontal asymptote.
(c) The rational function $f(x)$ has four vertical asymptotes and $y = 4$ is a horizontal asymptote.
(d) The rational function $f(x)$ has three vertical asymptotes and $y = 3$ is a horizontal asymptote.
(e) The rational function $f(x)$ has two vertical asymptotes and $y = 6$ is a horizontal asymptote.

27. Let $y = \dfrac{1}{1+2x}$. Then the inverse function is

(a) $y = \dfrac{2x}{x-1}$ (b) $y = -\dfrac{2x}{x-1}$ (c) $y = \dfrac{1-x}{x}$ (d) $y = \dfrac{x-1}{2x}$ (e) $y = \dfrac{1-x}{2x}$

28. The solution set to the inequality $x^2 - 7x + 12 < 0$ is

(a) $(-3, 4)$ (b) $(3, 4)$ (c) $(-4, 3)$ (d) $(4, \infty)$ (e) $(2, 3)$

29. If y is inversely proportional to x and when $x = 5$ then $y = 3$. What is the value of y when $x = 1$?

(a) 18 (b) 16 (c) 15 (d) 14 (e) 10

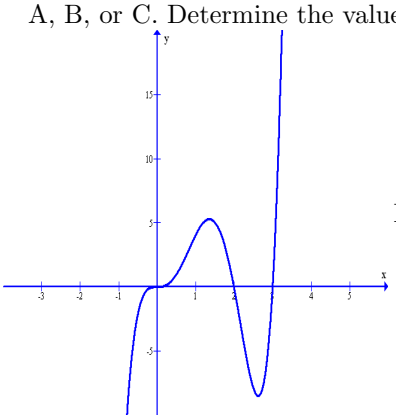
30. If one solves the inequality $\dfrac{x+1}{x-1} \leq 2$ one obtains

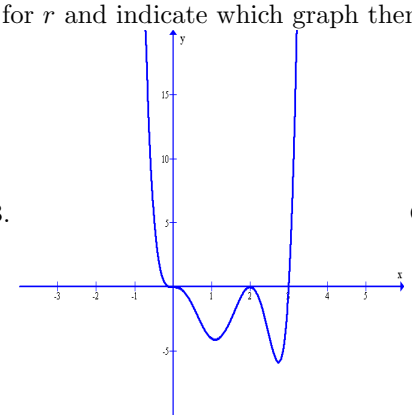
(a) $(-\infty, 1) \cup [3, \infty)$ (b) $(-\infty, 1] \cup [5, \infty)$ (c) $(2, 5]$ (d) all reals except $x = 1$ (e) $(1, 3]$

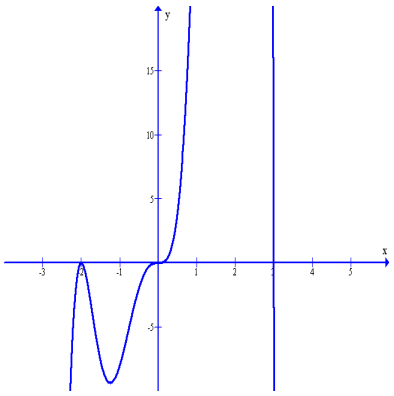
31. Using the possible rational root theorem to help factor $5x^3 - 12x^2 - 8x - 3$, we can conclude that:

(a) 3 is a root and $5x^2 + 3x + 1$ is a factor (i.e. quotient)
(b) $\frac{5}{3}$ is a possible rational root but it is not a root
(c) 5 is a root and $x^2 - 10x - 8$ is a factor
(d) -1 is a possible rational root and $x + 1$ is a factor
(e) none of the above.

32. There is a value for r so that the polynomial $y = -2x^3(x-r)^2(x-3)$ would match one of the graphs A, B, or C. Determine the value for r and indicate which graph then matches.

A. 

B. 

C. 

(a) $r = 1$ and matches graph A.
(b) $r = 2$ and matches graph B.
(c) $r = 2$ and matches graph A.
(d) $r = -2$ and matches graph C.
(e) $r = -2$ and matches graph B.

33. If one divides $2\,x^{20} + 3x + 1$ by $x - 1$ the remainder is

(a) 3 (b) 6 (c) 1 (d) 5 (e) 4

34. If one combines $\ln x^2 - \ln(x+2) + 3\ln z$ into a single expression one gets

(a) $\ln \dfrac{x^2(x+2)}{z^3}$ (b) $\ln \dfrac{x^3(x+2)}{z^3}$ (c) $\ln \dfrac{x^2}{z^3(x+2)}$ (d) $\ln \dfrac{x(x+2)}{z^3}$ (e) $\ln \dfrac{x^2z^3}{(x+2)}$

35. If \$26000 is invested at 6% compounded monthly how much is in the account after 30 yrs ?

(a) \$171,238 (b) \$ 156,587 (c) \$175,954 (d) \$125,120 (e) \$177,345

36. How long does it take money to triple if it is invested at 9% compounded continuously ?

(a) 11.56 yrs (b) 14.86 yrs (c) 15.49 yrs (d) 16.95 yrs (e) 12.21 yrs

37. A person invests \$50 a month in an account that pays interest monthly with an annual interest rate of 8% . How much is in the account after 20 years ?

(a) \$31,238 (b) \$27,678 (c) \$35,954 (d) \$29,451 (e) \$23,452

38. Solve the equation $2\log_5(\sqrt{x}) + \log_5(x+4) = 1$

(a) $x = 5$ (b) $x = 25$ (c) $x = 1, -5$ (d) $-2 \pm \sqrt{5}$ (e) $x = 1$

39. The decay model for the carbon-14 isotope is $A(t) = A_0 e^{-.000121t}$. Cave paintings were discovered this year with 13% of the carbon-14 remaining. How old are the paintings?

(a) 15892 yrs (b) 17201 yrs (c) 14657 yrs (d) 16861 yrs (e) 19530 yrs

40. Solve each of the following two systems of linear equations

System I	System II
$x + 2y = 5$	$5x - y = 1$
$x + 3y = 7$	$2x + y = 20$

Which of the following statements is correct?

(a) System I has no solution and System II has infinitely many solutions.
(b) From the solution to system I, the x-value added to the y-value is -2.
(c) The y-value from the solution to system I added to the y-value from the solution to II is 16.
(d) System I has a unique solution and System II has no solutions.
(e) The x-value from the solution to system I added to the y-value from the solution to II is -3.