MATH 1100 COMMON FINAL EXAM, SPRING 2012

1. Simplify the rational expression.

$$\frac{x^2 - x - 2}{x + 1}$$

   (a) $x + 2$
   (b) $x - 2$
   (c) $x - 1$
   (d) $x + 1$
   (e) No solution.

2. Simplify.

$$\sqrt{4x^8}$$

   (a) $16x$
   (b) $2x^4$
   (c) $4x^4$
   (d) $16x^2$
   (e) $8x^2$.

3. Simplify.

$$\frac{1 + \frac{1}{x}}{1 - \frac{1}{x}}$$

   (a) $\frac{2x+1}{x-2}$
   (b) $\frac{x+1}{x-2}$
   (c) $\frac{x^2+1}{x-1}$
   (d) $\frac{x-1}{x+1}$
   (e) $\frac{x+1}{x-1}$.

4. Rationalize the denominator.

$$\frac{\sqrt{25}}{\sqrt{7}+1}$$

   (a) $\frac{5\sqrt{7}}{6}$
   (b) $\frac{\sqrt{7}}{6}$
   (c) $\frac{5\sqrt{7}-1}{6}$
   (d) $\frac{5\sqrt{7}-5}{6}$
   (e) $\frac{25\sqrt{7}}{7}$.

5. Factor the trinomial.

$$2x^2 + 3x - 14$$

(a) $(x-2)(2x-7)$
(b) $(x+2)(2x+7)$
(c) $(x-2)(2x+7)$
(d) $(x+2)(2x-7)$
(e) $(x+1)(x+14)$.

6. Factor the polynomial.

$$x^2 - 6xy + 9y^2$$

(a) $(3x-y)^2$
(b) $(x+3y)^2$
(c) $(x-3y)^2$
(d) $(x-y)^2$
(e) $(x+y)^2$.

7. Solve the equation.

$$3x - 10 = 14$$

(a) 8
(b) 9
(c) 7
(d) 6
(e) Solution does not exist.

8. Solve the equation.

$$\frac{x}{3} + 4 = \frac{2x}{5}$$

(a) 30
(b) 40
(c) 120
(d) 50
(e) 60.

9. Solve the formula for b.

$$A = \frac{1}{2}bh - 1$$

(a) $\frac{h+1}{2A}$
(b) $\frac{A+1}{2h}$
(c) $\frac{2h}{A+1}$
(d) $\frac{2A+2}{h}$
(e) $\frac{h}{2A}$.

10. You inherit $\$100,000$ and will invest the money in two stocks paying 6% and 11% annual dividends, respectively. How much should be invested at each rate if the

total dividends earned for the year is to be $9000?

(a) $10,000$ invested at 6%; $90,000$ invested at 11%.
(b) $20,000$ invested at 6%; $80,000$ invested at 11%.
(c) $30,000$ invested at 6%; $70,000$ invested at 11%.
(d) $40,000$ invested at 6%; $60,000$ invested at 11%.
(e) $50,000$ invested at 6%; $50,000$ invested at 11%.

11. Find the number of real solutions of the equation.

$$\sqrt{10x - 1} = x + 2$$

(a) 0
(b) 1
(c) 2
(d) 3
(e) 4.

12. Solve the inequality.

$$20 < 44 - 3x$$

(a) $(-\infty, 8]$
(b) $(-\infty, 8)$
(c) $(-\infty, -8)$
(d) $(8, \infty)$
(e) $(-8, 8)$.

13. Solve the inequality.

$$|x - 1| - 5 \leq 4$$

(a) $[-8, 10]$
(b) $[-10, 8]$
(c) $(-8, 10)$
(d) $(-10, 8)$
(e) $[-9, 9]$.

14. Solve the quadratic inequality.

$$x^2 \geq x + 6$$

(a) $(-\infty, -2] \cup [3, \infty)$
(b) $[-2, 3]$.
(c) $(-\infty, -3] \cup [2, \infty)$
(d) $(-\infty, -2) \cup (3, \infty)$
(e) $(-2, 3)$.

15. Solve the rational inequality.

$$\frac{x-3}{x+2} \le 0$$

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

16. Use the distance formula find the distance from $A(4, -3)$ to $B(1, -7)$.

(a) $\sqrt{13}$
(b) 5
(c) $\sqrt{15}$
(d) 3
(e) $2\sqrt{2}$.

17. Find the slope of the line passing through $A(4, -3)$ and $B(1, -1)$.

(a) $-\frac{1}{2}$
(b) $\frac{2}{3}$
(c) $-\frac{2}{3}$
(d) $\frac{1}{2}$
(e) $-\frac{3}{4}$.

18. Find the equation of the line passing through $P(0, 5)$ and parallel to the line $2x + y = 3$.

(a) $y = -2x - 1$
(b) $y = 2x + 5$
(c) $y = -2x + 5$
(d) $y = 2x - 5$
(e) $3x + 2y = -5$.

19. Which of the following functions is odd?

(a) $y = x^3 - 2$
(b) $y = 2x - 1$
(c) $y = x^3 - x$
(d) $y = x^4 - x^2$
(e) $y = x^4 - x^3$.

20. Find the center and radius of the following circle.

$$x^2 + y^2 + 10x - 12y - 20 = 0$$

(a) $(-4, 5), r = 3$
(b) $(-5, -6), r = 9$
(c) $(5, 6), r = 9$
(d) $(5, -6), r = 9$
(e) $(-5, 6), r = 9$.

21. Find the coordinates of the midpoint M of $A(1, 2)$ and $B(-6, -3)$.

(a) $(\frac{7}{2}, -\frac{1}{2})$
(b) $(6, -1)$
(c) $(-\frac{5}{2}, -\frac{1}{2})$
(d) $(0, 0)$
(e) $(1, 1)$.

22. Evaluate the value $A = f(0) + f(3)$ where the function $f(x)$ is defined as

$$f(x) = \begin{cases} 2x - 1 & x \le 2 \\ x^2 + 1 & x > 2 \end{cases}$$

(a) 8
(b) 16
(c) 12
(d) 10
(e) 9.

23. If the point $(2, 8)$ is on the graph of a one-to-one function $f(x)$, find the value of $f(2) + f^{-1}(8)$.

(a) 2
(b) 8
(c) $\frac{15}{8}$
(d) 9
(e) 10.

24. For $f(x) = 2x - 1$ and $g(x) = x^2 + x + 1$, evaluate $f \circ g(3)$.

(a) 22
(b) 23
(c) 24
(d) 25
(e) 26.

25. Find the domain of the function $f(x)$.

$$f(x) = \sqrt{x - 1}$$

(a) $[-1,1]$
(b) $(-\infty,-1)$
(c) $[1,\infty)$
(d) $[-1,\infty)$
(e) $(-1,\infty)$.

26. Divide $P(x) = 4x^{15} - 6x^2 - 5x + 6$ by $(x-1)$ and find the remainder R.

(a) $R = -1$
(b) $R = 2012$
(c) $R = -141$
(d) $R = -891$
(e) $R = 1$.

27. Find the vertex of the parabola described by $f(x)$.

$$f(x) = 2x^2 - 8x - 1$$

(a) $(2,-1)$
(b) $(4,-9)$
(c) $(2,-8)$
(d) $(-2,-9)$
(e) $(2,-9)$.

28. Find the inverse function for $f(x) = 4x + 3$.

(a) $f^{-1}(x) = \frac{1}{4}x + \frac{3}{4}$
(b) $f^{-1}(x) = \frac{3}{4}x + \frac{1}{4}$
(c) $f^{-1}(x) = \frac{1}{4}x - \frac{3}{4}$
(d) $f^{-1}(x) = -\frac{1}{4}x + \frac{3}{4}$
(e) $f^{-1}(x) = \frac{1}{4}x + \frac{5}{4}$.

29. The graph of polynomial function $f(x) = a(x+1)^2(x-2)$ passes through point $(0,2)$. Find the value of a.

(a) 5
(b) $\frac{3}{2}$
(c) 2
(d) $-\frac{1}{2}$
(e) -1.

30. Solve the equation $x^3 - 6x^2 + 11x - 6 = 0$ for all real solutions given that $x = 2$ is a zero.
Hint: (x-2) is a factor. Use synthetic division.

(a) $\{-1 - \sqrt{3}, -1 + \sqrt{3}, 3\}$
(b) $\{1, 2, 3\}$
(c) $\{-1, 2, 3\}$

(d) $\{1, 2\}$

(e) $\{2\}$.

31. Find all vertical asymptotes for the function $f(x) = \frac{x^2+1}{x^2+4x+3}$.

(a) $x = -1, x = -3$

(b) $y = 1$

(c) $x = 2, x = 3$

(d) $x = 1$

(e) No vertical asymptote.

32. Find the horizontal asymptote for the function $f(x) = \frac{x-1}{x^2-5x+6}$.

(a) $y = 2$

(b) $y = 1$

(c) $y = 0$

(d) $y = -2$

(e) No horizontal asymptote.

33. The amount of gas that a helicopter uses is directly proportional to the number of hours spent flying. The helicopter flies for 5 hours and uses 40 gallons of fuel. Find the number of gallons of fuel that the helicopter uses to fly for 4 hours.

(a) 25 gallons

(b) 39 gallons

(c) 44 gallons

(d) 32 gallons

(e) 45 gallons

34. Use your calculator to calculate $3^{\sqrt{2}}$. Round your answer to two decimal places.

(a) 4.73

(b) 5.21

(c) 8.45

(d) 3.29

(e) 10.66

35. Use the properties of logarithms to write $\ln \sqrt[3]{\frac{x}{x-1}}$ as a sum or difference of simple logarithmic terms.

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

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

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

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

(e) $\frac{1}{3}\ln x - \ln(x-1)$

36. Solve the equation $2^{3x+1} = 15$. Round your answers to two decimal places.

(a) 7.43
(b) 2.19
(c) 0.97
(d) 1.90
(e) 3.21

37. Use the change of base formula and your calculator to calculate $\log_2 3$. Round your answer to two decimal digits.

(a) 5.88
(b) 3.15
(c) 0.48
(d) 1.10
(e) 1.58

38. Solve the equation $\log_2(x + 1) = 0$.

(a) 0
(b) 1
(c) 2
(d) 3
(e) No solution.

39. At age 20 Mike inherited $ 100,000 from his grand parents. Then he invested the money in bank with 8% annual rate compounded continuously. Find his account balance 45 years later when Mike is 65. Round your answer to the nearest dollar.

(a) $1,088,176$
(b) $2,275,882$
(c) $117,588$
(d) $200,104$
(e) $3,659,823$

40. Solve the system.

$$2x + 27y = 31$$
$$2x - 3y = 1$$

(a) $x = 0, y = 1$
(b) $x = 1, y = 0$
(c) $x = 1, y = 1$
(d) $x = 0, y = 0$
(e) $x = 2, y = 1.$