

**016 Final, Fall 2014**

1. [6] Evaluate the following expressions.

(a)  $[1 - (-23)] \div [(-2) - 4] + (4)(-9)$

(b)  $\frac{3}{2} - \frac{2}{5} \div \frac{-2}{3} + 3(\frac{5}{6} + \frac{-3}{4})$

(c)  $\frac{-5^2 + (-3)^2 - (-6) + (2)(4)^2}{|10 - 3(2 + 4)|}$

2. [4] Expand and simplify the following algebraic expressions.

(a)  $-(2xy + 7y) + (5x - 3)(-xy + 3y)$

(b)  $(2x + 3)^2 + 8[(3 - x) - (x + 2)(x - 2)]$

3. [6] Solve for  $x$ .

(a)  $6x + 8 = 4[3x - 2 - 2(x + 1)]$

(b)  $\frac{x + 2}{5} = \frac{x - 6}{4}$

(c)  $\frac{4}{3}(x - 3) = 5(\frac{1}{4}x + \frac{1}{3})$

4. [4] Simplify. Your answers should have no negative exponents.

(a)  $\left(\frac{75a^6bc^5}{50a^2b^{-2}c^7}\right)^4$

(b)  $[x^0(2xy^{-3})^2y]^3(-3x^{-1}y^3)^{-2}$

5. [4] Factor completely.

(a)  $4x^4 + 8x^2 - 12$

(b)  $24x^2 + 3x^5$

6. [6] Solve by factoring.

(a)  $3x^2 + 5x = 2$

(b)  $16x^3 - x = 0$

(c)  $2x^3 + x^2 - 18x - 9 = 0$

7. [2] The store I bought my new shoes from marks up their products by 20%. If I paid \$48 for these shoes, how much did the store pay for them?

$Selling\ Price = (Cost) + (Markup\ Rate) \times (Cost)$

8. [2] My initial investment of \$3000 earned an interest of \$1440 after 4 years. What was the interest rate? (Recall:  $I = Prt$ )

9. [8] Simplify.

(a)  $-4x^2z\sqrt{99x^3y^{12}z^4}$

(b)  $y^2\sqrt{\frac{32x^7z^2}{16x^4z^2}}$

(c)  $-\sqrt{63} - \sqrt{50} + 2\sqrt{28} - 5\sqrt{72}$

(d)  $(4\sqrt{3} - \sqrt{2})(\sqrt{12} + 3\sqrt{2})$

10. [3] Solve for  $x$  or show that there is no solution. Check your answer.

$x = \sqrt{3-x} + 1$

11. [3] Rationalize the denominator and simplify.

(a)  $\frac{\sqrt{2}}{3\sqrt{6}}$

(b)  $\frac{\sqrt{3}}{2\sqrt{3} - \sqrt{5}}$

12. [3] Using the Quadratic Formula, find the solution(s) to  $4x^2 + 3x = 1$ .

13. [3] By completing the square, find the solution(s) to  $x^2 + 6x - 31 = 0$ .

14. [3] By taking square roots, find the solution(s) to  $4(2x + 4)^2 = 32$ .

15. [3] Solve the system by substitution.

$5x + 4y = 4$

$3x + 2y = 3$

16. [3] Solve the system by elimination.

$3x + 6y = 1$

$2x + 4y = 5$

17. [3] For the points A(-3,-12) and B(1,-14):

(a) Find the distance between A and B.

(b) Find the midpoint of the line segment joining A and B.

18. [5] Find an equation for

(a) The line that passes through (2,-1) and (5,4).

(b) The line that passes through (20,3) and is perpendicular to the line  $y = 5x - 1$ .

(c) The horizontal line through (-2,4).

19. [5] For the line  $2x - 9y = -36$

(a) Find the intercepts.

(b) Find the slope.

(c) Sketch.

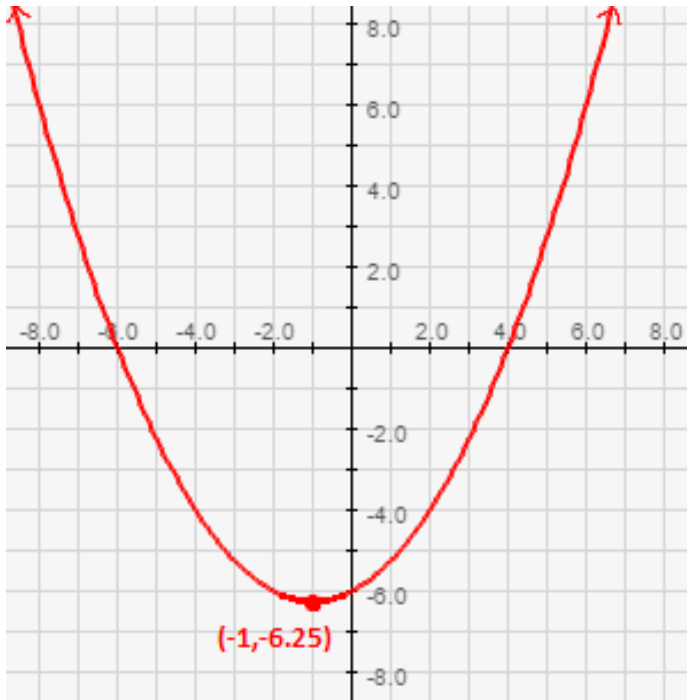
20. [5] Given  $f(x) = -x^2 - 6x + 16$  and  $g(x) = 2 - 5x$ , find the following:

(a)  $f(-2)$

(b) The value(s) of  $x$  for which  $f(x) = 0$ .

(c)  $f(\frac{1}{2}) - g(\frac{1}{5})$

21. [5] Find the domain, range, intercepts, sign (where the function is positive/negative) and extrema (local max/min) of the following function.



22. [6] Solve for  $x$ .

(a)  $16^{2-3x} = 32^{5x+1}$

(b)  $3 - \frac{9^{x+2}}{9^7} = 2$

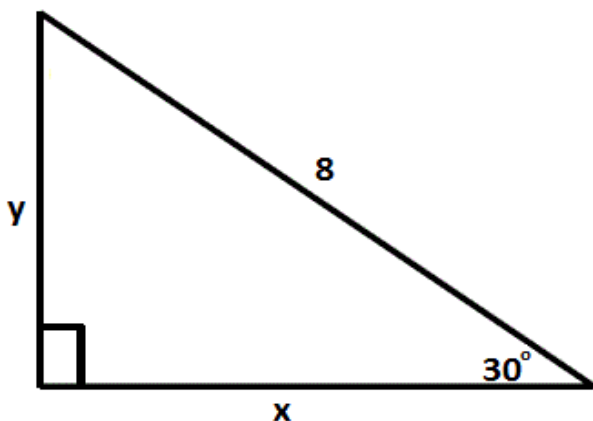
(c)  $5 - (3 + e^{\frac{x}{2}}) = -1$

23. [3] Let  $\theta$  be an acute angle of a right triangle. Given  $\tan \theta = \frac{\sqrt{7}}{2}$ , find the values of the other five trigonometric functions.

24. [2] Find the acute angle  $\theta$  given

$\csc \theta = \sqrt{2}$ .

25. [3] Find  $x$  and  $y$ .



## Answers

1.

(a) -40

(b)  $\frac{47}{20}$

(c)  $\frac{11}{4}$

2.

(a)  $16xy - 16y - 5x^2y$

(b)  $-4x^2 + 4x + 65$

3.

(a)  $x = -12$

(b)  $x = 38$

(c)  $x = 68$

4.

(a)  $\frac{81a^{16}b^{12}}{16c^8}$

(b)  $\frac{64x^8}{9y^{21}}$

5.

(a)  $4(x-1)(x+1)(x^2+3)$

(b)  $3x^2(2+x)(4-2x+x^2)$

6.

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

(b)  $x = 0, \frac{1}{4}, -\frac{1}{4}$

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

7.  $C = \$40$

8. 12%

9.

(a)  $-12x^3y^6z^3\sqrt{11x}$

(b)  $xy^2\sqrt{2x}$

(c)  $\sqrt{7} - 35\sqrt{2}$

(d)  $18 + 10\sqrt{6}$

10.  $x = 2$

11.

(a)  $\frac{\sqrt{3}}{9}$

(b)  $\frac{6 + \sqrt{15}}{7}$

12.  $x = -1, \frac{1}{4}$

13.  $x = -3 + 2\sqrt{10}, -3 - 2\sqrt{10}$

14.  $x = -2 + \sqrt{2}, -2 - \sqrt{2}$

15.  $x=2, y=-\frac{3}{2}$

16. no solution

17.

(a)  $2\sqrt{5}$

(b)  $(-1, -13)$

18.

(a)  $y=\frac{5}{3}x-\frac{13}{3}$

(b)  $y=-\frac{1}{5}x+7$

(c)  $y=4$

19.

(a)  $(-18,0), (0,4)$

(b)  $\frac{2}{9}$

(c)

20.

(a) 24

(b)  $x=-8, 2$

(c)  $\frac{47}{4}$

21. Domain:  $]-\infty, \infty[$  Range:  $[-6.25, \infty[$

Intercepts:  $(-6,0), (4,0), (0,-6)$  Positive:

$]-\infty, -6[\cup]4, \infty[$  Negative:  $]-6, 4[$

Extrema: minimum at  $(-1, -6.25)$

22.

(a)  $x=\frac{3}{37}$

(b)  $x=5$

(c)  $x=2\ln 3$

23.  $\sin\theta=\frac{\sqrt{77}}{11}, \cos\theta=\frac{2\sqrt{11}}{11}, \tan\theta=\frac{\sqrt{7}}{2}$

$\csc\theta=\frac{\sqrt{77}}{7}, \sec\theta=\frac{\sqrt{11}}{2}, \cot\theta=\frac{2\sqrt{7}}{7}$

24.  $\theta=45$  degrees

25.  $x=4\sqrt{3}, y=4$