016 Final Exam – Winter 2014

1. **[6]** Evaluate the following expressions.

   (a) $\left(\dfrac{2}{7}-\dfrac{4}{5}\right)-\left(\dfrac{1}{7}\cdot\dfrac{3}{5}+\dfrac{1}{2}\right)$

   (b) $\left|(-2)^3+3^2-4^1+5^0\right|+\left|-2+3-4+5\right|-2$

   (c) $-\dfrac{3}{7}-\dfrac{7}{3}\div\left(\dfrac{5}{6}+\dfrac{-3}{5}\right)$

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

   (a) $2\left[x(x+1)-2(1-x)\right]-(x-1)(x+3)$

   (b) $(2x-5)^2-(2x-5)-x(x+1)$

3. **[6]** Solve for x.

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

   (b) $\dfrac{22}{12}x-\dfrac{4}{3}=2\left(\dfrac{5}{4}x-\dfrac{7}{3}\right)$

   (c) $\dfrac{x}{3}-\dfrac{(x+2)}{8}=\dfrac{-x-3}{6}+\dfrac{2-x}{4}$

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

   (a) $\left(\dfrac{35x^{-5}y^2z^4}{7x^{-3}y^{-3}z^5}\right)^2$

   (b) $(10xy^2z^{-3})^2(5x^3y^{-2}z^{-1})^{-2}$

5. **[4]** Factor completely.

   (a) $10x^3-26x^2+16x$

   (b) $27x^5-x^2$

6. **[6]** Solve *by factoring*.

   (a) $3x^2+4x=15$

   (b) $x^3-4x^2=21x$

   (c) $x^2(x+5)=9x+45$

7. **[2]** A textbook is on sale for \$63 after a discount of 16%. Find the original price of the textbook. ($SP=OP-DR\cdot OP$)

8. **[2]** How long will it take for a principal of \$3500 to earn \$420 in interest if the annual simple interest rate is 4% ? (Recall: $I=Prt$)

9. **[8]** Simplify.

   (a) $\sqrt{\dfrac{16x^{-7}z^5}{12x^3y^8z^{-5}}}$

   (b) $5x^3y\sqrt{28x^{15}y^{10}z^3}$

   (c) $2\sqrt{45}-\sqrt{500}+7\sqrt{75}-5\sqrt{12}$

   (d) $(5\sqrt{2}+\sqrt{6})(7\sqrt{6}-3\sqrt{2})$

10. **[3]** Solve for x or show that there is no solution. Check your answer.
    $\sqrt{3x+7}-3=x$

11. **[3]** Rationalize the denominator and simplify.

    (a) $\dfrac{\sqrt{2}}{\sqrt{10}}$

    (b) $\dfrac{\sqrt{3}+2\sqrt{2}}{3\sqrt{2}-2\sqrt{3}}$

12. **[3]** *Using the Quadratic Formula*, find the solution(s) to $2(x^2+3x)=x^2-6$.

13. **[3]** *By completing the square*, find the solution(s) to $x^2-24=10x$.

14. **[3]** *By taking square roots*, find the solution(s) to $16\left(x-\dfrac{3}{4}\right)^2-25=0$.

15. **[3]** Solve the system by *substitution*.
    $8x-2y=6$
    $4x-3y=1$

16. **[3]** Solve the system by *elimination*.
    $2x+3y=5$
    $7x-12y=-3$

17. **[3]** Determine whether the following pairs of lines are parallel, perpendicular, or neither.

    (a) $2x-y=3$
    $-2x+4y=5$

    (b) $x+y=3$
    $2x-2y=4$

18. **[8]** Given points A(-3,11), B(1,5), C(6,0)

    (a) Write an equation for the line that passes through B and C.

    (b) Write an equation for the line that passes through A and is parallel to the line $x=4$.

    (c) Determine the distance between the points A and B.

    (d) Find the midpoint of the line segment connecting A and C.
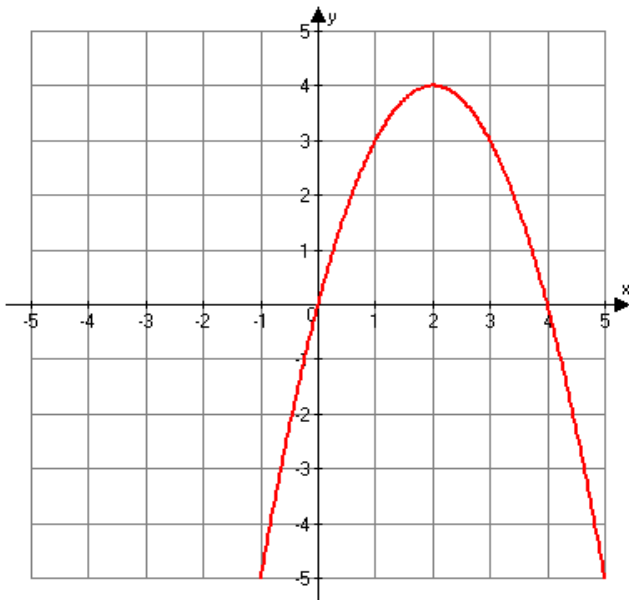
19. **[4]** For the line $2x+4y=-8$

    (a) Find the intercepts.

    (b) Sketch.

20.[3] Given $f(x)=-3x^2+2x+4$, find the following:
  (a) $f(-2)$
  (b) The value(s) of x for which $f(x)=4$.

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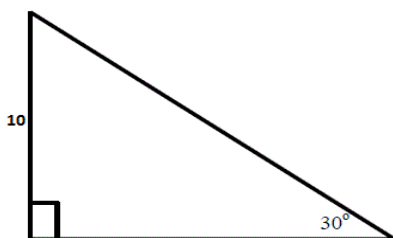

22.[6] Solve for x.
  (a) $7-2e^{7x+5}=3$
  (b) $4^{4x-3}-1=15$
  (c) $\left(\dfrac{1}{7}\right)^x=49^{x+6}$

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

24.[2] Find the acute angle θ given $\cot\theta=\dfrac{1}{\sqrt{3}}$.

25.[3] Find the missing side lengths.

Answers
1.
  (a) -11/10
  (b) 2
  (c) -73/7
2.
  (a) x^2+4x-1
  (b) $3x^2-23x+30$
3.
  (a) 2
  (b) 5
  (c) 2/5
4.
  (a) $\dfrac{25y^{10}}{x^4z^2}$
  (b) $\dfrac{4y^8}{x^4z^4}$
5.
  (a) $2x(x-1)(5x-8)$
  (b) $x^2(3x-1)(9x^2+3x+1)$
6.
  (a) 5/3, -3
  (b) 0, 7, -3
  (c) 3, -3, ~~5~~ -5
7. $75
8. 3 years
9.
  (a) $\dfrac{2z^5\sqrt{3}}{3x^5y^4}$
  (b) $10x^{10}y^6z\sqrt{7xz}$
  (c) $-4\sqrt{5}+25\sqrt{3}$
  (d) $64\sqrt{3}+12$
10. -1, -2
11.
  (a) $\dfrac{\sqrt{5}}{5}$
  (b) $\dfrac{18+7\sqrt{6}}{6}$
12. $-3+\sqrt{3},\ -3-\sqrt{3}$
13. 12, -2
14. 2, -1/2
15. $x=1,\ y=1$
16. $x=17/15,\ y=41/45$

17.
   (a) neither
   (b) perp.
18.
   (a) $y=-x+6$
   (b) $x=-3$
   (c) $2\sqrt{13}$
   (d) $(3/2, 11/2)$
19.
   (a) $x=-4, \; y=-2$
20.
   (a) -12
   (b) 0, 2/3
21. domain: all real numbers
   range: $y \leq 4$
   x-intercepts: (0,0) and (4,0)
   y-intercepts: (0,0)
   positive: $0 < x < 4$
   negative: $x < 0$ or $x > 4$
   local max: (2,4)
22.
   (a) $\dfrac{\ln 2 - 5}{7}$
   (b) 5/4
   (c) -4
23. $\sin\theta = \dfrac{2\sqrt{10}}{7}, \quad \tan\theta = \dfrac{2\sqrt{10}}{3}$

   $\csc\theta = \dfrac{7}{2\sqrt{10}}, \quad \cot\theta = \dfrac{3}{2\sqrt{10}}, \quad \sec\theta = \dfrac{7}{3}$
24. 60 degrees

25. $r = 20, \; x = 10\sqrt{3}$