# MAC 1105 Review 2, Fall 2015

1. Solve the equations:

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

(d) $\sqrt{x^2+10x+1}+1=3x$ (e) $(x+1)^{2/3}-3(x+1)^{1/3}-10=0$ (f) $(x-2)^{\frac{2}{3}}=9$

2. If you can clean the house in 2 hours and your friend can clean the house in 3 hours, how long does it take you to clean the house together?

3. Solve the inequalities, giving your answers in interval notation:

(a) $2x+5\leq 4+3x$ (b) $-3<1-2(x+5)\leq 5$

(c) $x^2+3x-4\geq 0$ (d) $6x^2-11x<10$

(e) $\dfrac{6-x}{x+2}>1$ (f) $\dfrac{-6}{3x-5}\leq 2$

4. Solve each absolute value equation:

(a) $|1-2x|=|3x-5|$ (b) $|x^3+2x^2-3x+2|+1=0$

(c) $\left|\dfrac{4x-3}{3x+4}\right|=3$ (d) $|x^2-2x|=8$

5. Solve each absolute value inequality, giving answers in interval notation:

(a) $2+|2-x|\leq 0$ (b) $2+|2-x|\geq 0$

(c) $\dfrac{1}{3}\left|1-\dfrac{2x}{5}\right|<3$ (d) $3-|x+1|<\dfrac{1}{2}$

6. Find the distance from the origin to the midpoint of the line segment joining (4,10) and $(2,-2)$.

7. Determine whether the points (5,7), (3,9), and (6,8) are the vertices of a right triangle.

8. Determine whether the points $(-2,-5)$, (1,7), and (3,15) are collinear.

9. Find the center-radius form of the equation for each circle:

(a) center $(-2,3)$, radius 15 (b) center $(-8,1)$, passing through (0,16)

(c) $x^2+y^2-12x+10y=-25$

10. Which of the following relations define $y$ as a function of $x$? Find the domain, range, and symmetries of each.

(a) $y^2-2=3x$ (b) $x-2y=0$ (c) $y+|x|=0$

(d) $x^2+y^2=9$ (e) $y=\sqrt{9-x^2}$

11. Find the average rate of change of $f(x)=\dfrac{1}{1-x}$ on the interval (a) $[-3,-1]$; (b) [2,10].

12. Write the standard form of the equation of the line passing through the point $(-6,-3)$ and parallel to the line through $(-1,2)$ and $\left(\frac{1}{2},4\right)$.

13. Write the slope-intercept form of the equation of the line passing through the point $\left(\frac{3}{5},-2\right)$ which is perpendicular to the line $3x-2y=6$.

14. Consider the piecewise defined function $f(x)=\begin{cases} x^2 & \text{if } x<0 \\ x-1 & \text{if } 0\le x<2 \\ 1 & \text{if } x\ge 2 \end{cases}$

Find $f(-2), f(0), f(1), f(2)$, and $f(4)$. Sketch the graph of the function. On what open intervals is the function increasing, decreasing, and constant?

15. Test for symmetry and find each intercept of the equations:
(a) $y^2-x-1=0$ (b) $y=\dfrac{x}{x^2+1}$ (c) $2x-4y=6$

16. Classify the following functions as even, odd, or neither:
(a) $f(x)=\dfrac{2}{x-1}$ (b) $f(x)=\dfrac{1}{\sqrt{x^2+5}}$
(c) $f(x)=x^3-x$ (d) $f(x)=|x|$

17. If $(5,2)$ is on the graph of $f$ and $f$ is an even function, find $f(5)\cdot f(-5)$.

18. List all transformations that are needed to obtain the graph of $f(x)=-\sqrt{x-3}+1$ from the graph of $y=\sqrt{x}$. Find the domain and range of $f$ and sketch its graph.

19. Sketch the graph of $1-f(x+2)$ if $f(x)=\sqrt[3]{x}$.

20. Let $y=f(x)$ be a function with domain $D=[-2,7]$ and $R=[-1,5]$. Find the domain and range for the following functions:
(a) $y=-f(x)$ (b) $y=f(x)+2$
(c) $y=f(-x)$ (d) $y=f(x-2)-1$

21. Find the vertex and all intercepts of the quadratic functions by writing them in vertex form, then sketch the graph of each function.
(a) $f(x)=-2x^2+8x-8$ (b) $g(x)=x^2-x-6$

22. (a) Does the parabola with vertex $(-1,1)$ passing through $(1,3)$ have $x$-intercepts? What is the range of the function? Answer these questions just by sketching the graph.
(b) Find the equation of the parabola to verify your answers for part (a).

23. A ball is thrown upward with initial velocity 80 feet per second from a bridge of height 96 feet above a river. The height $h(t)$ of the ball above the water is given by $h(t) = -16t^2 + 80t + 96$, where $t$ is the number of seconds after it is thrown.
(a) What is the maximum height of the ball? When does the ball reach that height?
(b) After how many seconds will the ball fall into the river?

24. Use a quadratic function to find the dimensions of the rectangular region of maximum area that can be enclosed with 180 meters of fencing, if no fencing is needed along one side of the region.