

## MAT 1050 GROUP FINAL EXAM – Fall 2017

SHOW ALL WORK. DO NOT USE A CALCULATOR.

1. (8 pts.) Simplify by adding (or subtracting) like terms wherever possible:

$$\sqrt{x} + y^2 + 2^y - 5y^2 - 4 \cdot 2^y + 3^y - \sqrt{y}$$

2. (8 pts.) Simplify completely:  $\left(\frac{3x^{-2}y^4}{z^{-4}}\right)^{-2} \left(\frac{27y^{-2}}{2x^{-1}y^2z^0}\right)$

3. (8 pts.) Multiply and simplify completely:  $(5 - \sqrt{12})^2$

4. (8 pts.) Simplify completely:  $\frac{27^{\frac{1}{3}} + 27^{-\frac{2}{3}}}{27^{-\frac{1}{3}}}$

5. (9 pts.) Solve:  $4 - 3\left|\frac{4x-1}{3}\right| = 10$

6. (8 pts.) A triangle has a perimeter of 40 inches. The longest side is one less than three times the shortest side. The third side is equal to the difference of the longest side and the shortest side. Find the lengths of the three sides.

7. (8 pts.) Solve for  $r$ :  $\frac{1}{r} + \frac{s}{t} = 2$

8. (8 pts.) Let  $g$  be the function given by  $g(x) = \frac{x-3}{\sqrt{5-x}}$ .

What is the domain of  $g$ ?

9. (9 pts.) Let  $f$  be the function given by  $f(x) = 3x - |2x - 10|$ .

Find and simplify  $f(-3) - [f(1)]^2$ .

10. (8 pts.) Let  $f$  be the function given by  $f(x) = 2x^2 - 7$ .

Find and simplify  $\frac{f(x+h) - f(x)}{h}$ .

11. (8 pts.) Find the equation of the line that is perpendicular to the line  $-x - 3y = 12$  and passes through the point  $(0, -1)$ .

12. (9 pts.) The length of a rectangle is 1 cm. less than twice its width. The diagonal of the rectangle is exactly  $\sqrt{106}$  cm. Find the area of the rectangle.

13. (8 pts.) Solve, writing any non-real solutions in the form  $a+bi$ :  $\frac{1}{2}x^2 + 3x = -9$

14. (8 pts.) Graph, labeling the vertex and all  $x$  and  $y$  intercepts:  $h(x) = -x^2 - 6x + 16$

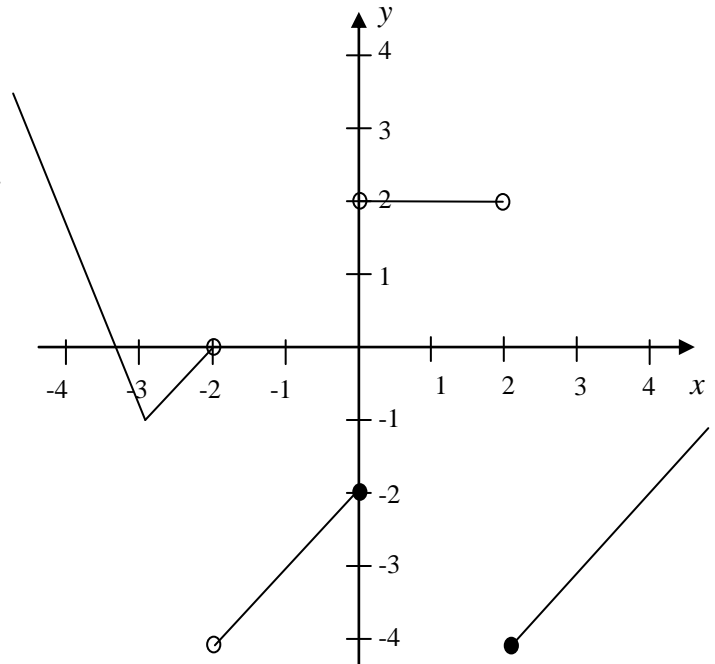
15. (8 pts.) Simplify completely:  $\frac{1 - \frac{2b}{b-1}}{1 + \frac{1}{b}}$

16. (8 pts.) Solve:  $\sqrt{x} - \sqrt{2x-7} = -1$

17. (9 pts.) Solve:  $x(x-3)^2 > 0$

18. (8 pts.) The graph of a function,  $f$ , is shown here.

- What is the domain of  $f$ ?
- What is the range of  $f$ ?
- Find all  $x$  such that  $f(x) = -3$ .
- What is  $f(0)$ ?



19. (9 pts.) Solve:  $x^{\frac{2}{3}} - x^{\frac{1}{3}} = 20$

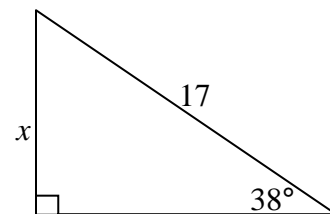
20. (9 pts.) Find: a)  $\log_{81}\left(\frac{1}{3}\right)$    b)  $\log_5(125)$    c)  $\log(\sqrt{1000})$

21. (8 pts.) Solve:  $\log_5(4-x) - 2\log_5(x) = 1$

22. (8 pts.) a) Convert  $\frac{20^\circ}{\pi}$  to radians.

b) Convert  $\frac{2}{5\pi}$  radians to degrees.

23. (9 pts.) For the right triangle shown here, find the exact value of  $x$ .



24. (9 pts.) Bob is traveling downstream at his typical speed with a current of 3 miles per hour. After 12 miles, the river joins with another and the current increases to 5 miles per hour. If the entire 40 mile trip took 3 hours, what is Bob's typical speed?