

The following 15 multiple choice questions are worth 5 points each.

1. Determine which of the following is equivalent to:  $\frac{2}{y+3} - \frac{y}{y-1} + \frac{y^2+2}{y^2+2y-3}$

a.  $\frac{2y+4}{y^2+2y-3}$

b.  $\frac{5y}{y^2+2y-3}$

c.  $\frac{-y}{y^2+2y-3}$

d.  $\frac{y^2-y+4}{y^2+2y-3}$

e.  $\frac{-1}{2y-3}$

2. Simplify:  $\frac{(8x^3+1)}{(x-3)(4x^2-2x+1)} \div \frac{(x^2-4)}{(x^2-x-6)}$

a.  $\frac{x+2}{x-3}$

b.  $\frac{x-6}{-4x-3}$

c.  $\frac{2x^3}{x-3}$

d.  $\frac{2x+1}{x-2}$

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

3. Which of the following is/are true?

I.  $i^{53} = -i$

II.  $3^{2x} \cdot 3 = 9^{2x}$

III.  $32^{-3/5} = \frac{1}{8}$

a. I and II only

b. II and III only

c. II only

d. III only

e. I and III only

4. Rewrite the following expression in  $a + bi$  form:  $\frac{1+i}{1+2i}$

a.  $-1 + \frac{1}{3}i$

b.  $\frac{3}{5} - \frac{1}{5}i$

c.  $1 - \frac{1}{3}i$

d.  $1 + \frac{1}{2}i$

e.  $-\frac{2}{3} + \frac{1}{3}i$

5. Solve for  $f_2$ :  $f = \frac{f_1 f_2}{f_1 + f_2}$

a.  $f_2 = \frac{f f_1}{f_1 - 1}$

b.  $f_2 = \frac{f f_1 - f f_2}{f_1}$

c.  $f_2 = \frac{f f_1}{f_1 - f}$

d.  $f_2 = f f_1 - f_1 + f$

e.  $f_2 = \frac{f f_1 + f f_2}{f_1}$

6. Solve:  $|4x - 5| + 7 \leq 3$

a. no solution

b. all real numbers

c.  $x \leq \frac{1}{4}$

d.  $x \leq \frac{1}{4}$  or  $x \geq \frac{9}{4}$

e.  $x \geq \frac{9}{4}$

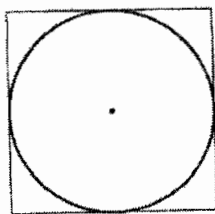
7. Solve:  $\frac{x-1}{3} = \frac{-5}{x-5}$

- a.  $3 \pm 2i\sqrt{11}$
- b.  $3 \pm 11i$
- c.  $3 \pm i\sqrt{11}$
- d.  $-3 \pm 22i$
- e.  $-3 \pm 2i\sqrt{29}$

8. Solve:  $\frac{7x+21}{x-1} \geq 0$

- a.  $(-\infty, -3] \cup [1, \infty)$
- b.  $(-\infty, -3) \cup (1, \infty)$
- c.  $[-3, 1]$
- d.  $[-3, 1)$
- e.  $(-\infty, -3] \cup (1, \infty)$

9. In the figure below, the circle is inscribed in the square. If the side of the square is  $t$  inches, express the area of the circle in terms of  $t$ .



- a.  $A = \pi t^2$  sq. inches
- b.  $A = \frac{\pi t^2}{4}$  sq. inches
- c.  $A = 4\pi t^2$  sq. inches
- d.  $A = \frac{\pi t^2}{2}$  sq. inches
- e. there is not enough information

10. Identify the center and radius of the circle represented by the following equation:

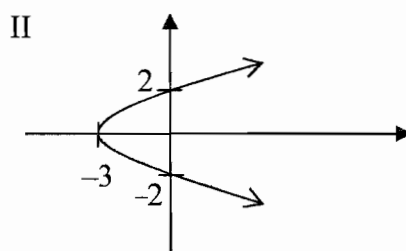
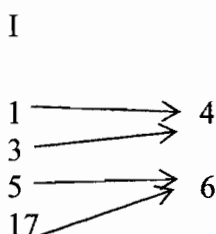
$$2x^2 + 2y^2 + 12x - 8y + 8 = 0$$

- a. center:  $(-3, 2)$ ;  $r = 3$
- b. center:  $(3, -2)$ ;  $r = 3$
- c. center:  $(-2, 3)$ ;  $r = 5$
- d. center:  $(3, 5)$ ;  $r = 5$
- e. center:  $(-2, -3)$ ;  $r = 2$

11. Determine the equation of the perpendicular bisector of the line segment joining the points  $(1, 3)$  and  $(9, 5)$ . What is the  $y$ -intercept of the linear equation that you found?

- a. 8
- b. 12
- c. 16
- d. 20
- e. 24

12. Which of the following relations represent functions?



III  $\{(1, 2), (1, 3), (1, 4)\}$

IV  $y = -3|x + 7|$

- a. Only I and IV are function.
- b. Only II, III and IV are functions.
- c. Only I is a function.
- d. Only I, II and IV are functions.
- e. Only III and IV are functions.

13. Let  $h(x) = \frac{1}{\sqrt{x-1}}$ . Find  $5g(6)$ .

a.  $\frac{\sqrt{5}}{10}$

b.  $5\sqrt{5}$

c.  $\sqrt{5}$

d.  $\frac{1}{\sqrt{5}}$

e.  $\frac{\sqrt{5}}{5}$

14. Determine the domain of:  $f(x) = \frac{\sqrt{x+5}}{x-2}$

a.  $[-5, \infty)$

b.  $[5, \infty)$

c.  $(-\infty, 2) \cup (2, \infty)$

d.  $[-5, 2) \cup (2, \infty)$

e.  $[0, 2) \cup (2, \infty)$

15. Does the graph of  $y = 4x^4 + 3x^2$  have any symmetry?

a. No symmetry

b. origin symmetry

c.  $x$ -axis symmetry

d.  $y$ -axis symmetry



17. (8 pts) Use the graphs to answer the questions.  
 (You do not need to show any work or to explain your answers for this problem.)

a. For what values of  $x$  is  $F(x) = 3$ ?

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b. What is the relative minimum value of  $G(x)$ ?

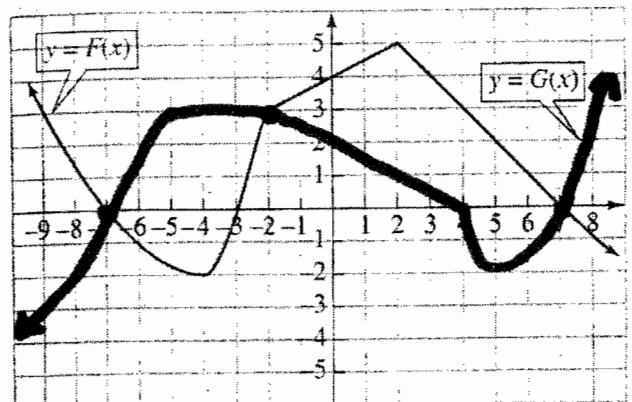
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c. On what intervals is  $F(x) > 0$ ?

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d. On what intervals is  $F(x)$  decreasing?

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18. (7 pts) Let  $f(x) = \frac{1}{x+2}$ . Determine and simplify the difference quotient:

$$\frac{f(x+h) - f(x)}{h}$$