

# Final Exam Practice

Math 120 (Doherty)

Name \_\_\_\_\_

1. Solve each equation for  $x$  and state the solution set. Also state whether the equation is inconsistent, conditional, or an identity.

(a)  $\{9, -6\}$  – conditional

(f)  $\{7\}$  – conditional

(b)  $\{3 \pm i\}$  – conditional

(g) There was a typo – if you changed the first = into +, you get  $\{\frac{9}{16}\}$ ; if you changed it into –, you get  $\emptyset$

(c)  $\{-1\}$  – conditional

(d)  $\{-6, 13\}$  – conditional

(h)  $\{-1 \pm \frac{\sqrt{2}}{4}\}$  – conditional

(e)  $\{b - \frac{a}{c}\}$  or  $\{\frac{bc-a}{c}\}$  – conditional

2. Sketch a graph of each of the following. State whether  $y$  is a function of  $x$ .

(a)  $2y + x = 4$  – yes

(b)  $(x + 1)^2 + (y - 2)^2 = 9$  – no (graph is a circle, fails the vertical line test)

3. Center:  $(2, -1)$ ; radius: 2; .

4. Given the points  $A(-3, 4)$  and  $B(1, 3)$ , find the following:

(a)  $\sqrt{17}$ ;

(b)  $(-1, \frac{7}{2})$ ;

(c)  $(x + 3)^2 + (y - 4)^2 = 17$ ;

(d)  $(x + 1)^2 + (y - \frac{7}{2})^2 = \frac{17}{4}$ ;

(e)  $y = -\frac{1}{4}x + \frac{13}{4}$ .

5. Given  $f(x) = 3x^2 - 2x$ , find and simplify:



13. If a toy rocket is fired up into the air from the top of a 10 foot latter with an initial velocity of 72 ft/s, its height above the earth after  $t$  seconds is given by  $f(t) = -16t^2 + 72t + 10$ .

- (a) 66 feet
- (b) 2.25 seconds
- (c) 91 feet
- (d)  $\frac{9+\sqrt{91}}{4}$

14. Let  $f(x) = \sqrt{2-x}$  and  $g(x) = 1 + 2x$ . Determine each of the following (simplify as much as possible):

- (a)  $\sqrt{3} - 1$
- (b)  $-2$
- (c)  $\frac{\sqrt{2-x}}{1+2x}$ ;  
 $(-\infty, -\frac{1}{2}) \cup (-\frac{1}{2}, 2]$
- domain: (d)  $\sqrt{1-2x}$
- (e)  $1 + 2\sqrt{2-x}$

15. Sketch a graph of

$$f(x) = \begin{cases} -|x| + 1 & \text{if } x \leq 2 \\ \sqrt{x-2} & \text{if } x > 2 \end{cases}$$

16. Let  $f(x) = -2(x+4)(x-3)^2$ .

- (a)  $x = -4$ , multiplicity 1;  $x = 3$ , multiplicity 2
- (b)  $(0, -72)$ .
- (c)  $f \rightarrow -\infty$  as  $x \rightarrow \infty$ , and  $f \rightarrow \infty$  as  $x \rightarrow -\infty$ .
- (d) Sketch a graph of  $f(x)$ . Clearly label all intercepts.

17. Sketch a graph of  $P(x) = x^4 - 17x^2 + 16$ .  $x$ -intercepts:  $(1, 0)$ ,  $(-1, 0)$ ,  $(4, 0)$ , and  $(-4, 0)$

18. For each function given below, find the intercepts and asymptotes. Then sketch a graph of the function.

- (a) Only intercept:  $(0, 0)$ . Vertical asymptotes:  $x = 2, x = -1$ ; horizontal asymptote:  $y = 0$ .
- (b) Intercepts:  $(1, 0), (0, -\frac{1}{2})$ ; asymptotes:  $x = -2, y = 1$ . (Hole in the graph at  $(-1, -2)$ ).

19. Solve each of the following inequalities. State the solution set in interval notation.

- (a)  $(-\infty, -3) \cup (6, \infty)$
- (b)  $(-\infty, -3] \cup [0, 3]$
- (c)  $(-1, \frac{5}{2})$
- (d)  $(-7, -1) \cup (3, \infty)$

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21. Let  $f(x) = 2x^3 - 9x^2 - 8x + 15$ .

- (a)  $\pm 1, \pm 3, \pm 5, \pm 15, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{5}{2}, \pm \frac{15}{2}$



- (a) About 15.4 years.
- (b) About 9.33 grams.

32. Solve each of the following systems by graphing, and state whether the system is dependent, independent, or inconsistent:

- (a)  $\emptyset$  – inconsistent
- (b)  $\{(x, y) \mid x - 2y = -3\}$  – dependent
- (c)  $(1, 2)$  – independent

33. Solve each of the following systems algebraically:

- (a)  $(-1, 1)$  – independent
- (b)  $(2\sqrt{2}, i)$
- (c)  $(0, 0), (1, 1), (-1, 1)$
- (d)  $(\frac{3}{2}, 3), (-5, 42)$

$$y = 2x^2 + x - 3$$

$$6x + y = 12$$

34. Determine whether the following sequences are arithmetic, geometric, or neither. If they're arithmetic or geometric, find the formula for the  $n$ th term, and find the sum of the first 11 terms.

- (a) Neither.
- (b) Arithmetic;  $a_n = 16 - 3(n - 1); S_{11} = 11$
- (c) Geometric;  $a_n = \frac{1}{3} \left(-\frac{1}{2}\right)^{n-1}; S_{11} = \frac{683}{3072}$

35. Write each sum using summation notation:

(a)  $\sum_{i=1}^4 \frac{5}{2} \left(-\frac{1}{4}\right)^{i-1}$                       (b)  $\sum_{i=1}^n i^2$

36. Find each infinite sum:

- (a) 2
- (b) 50

37.  $2^3(-3)^4 \cdot 35 = 22680$