

IM3 Module 7 Study Guide

Name: Key

For #1-10, perform the indicated operation.

1. $g(x) = -x^2 - 1 - 2x$
 $f(x) = x + 5$
 Find $(g - f)(x)$

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

$$-x^2 - 1 - 2x - x - 5$$

$$-x^2 - 3x - 6$$

2. $f(x) = 3x - 1$
 $g(x) = x^2 - x$
 Find $\left(\frac{f}{g}\right)(x)$

$$\frac{3x - 1}{x^2 - x}$$

3) $h(x) = 3x + 3$
 $g(x) = -4x + 1$
 Find $(h + g)(10)$

$$3x + 3 + -4x + 1$$

$$-x + 4$$

$$-(10) + 4 = -6$$

4) $g(a) = 3a + 2$
 $f(a) = 2a - 4$
 Find $\left(\frac{g}{f}\right)(3)$

$$\frac{3a + 2}{2a - 4} = \frac{3(3) + 2}{2(3) - 4} = \frac{11}{2}$$

5) $g(x) = 2x - 5$
 $h(x) = 4x + 5$
 Find $g(3) - h(3)$

$$2x - 5 - (4x + 5)$$

$$2x - 5 - 4x - 5 = -2x - 10$$

6) $g(a) = 2a - 1$
 $h(a) = 3a - 3$
 Find $(g \cdot h)(-4)$

$$(2a - 1)(3a - 3) = 6a^2 - 9a + 3$$

$$= 6(-4)^2 - 9(-4) + 3$$

$$= 96 + 36 + 3 = 135$$

7) $g(t) = t^2 + 3$
 $h(t) = 4t - 3$
 Find $(g \cdot h)(-1)$

$$(t^2 + 3)(4t - 3)$$

$$4t^3 - 3t^2 + 12t - 9$$

$$4(-1)^3 - 3(-1)^2 + 12(-1) - 9$$

$$-4 - 3 - 12 - 9$$

$$-28$$

8) $g(n) = 3n + 2$
 $f(n) = 2n^2 + 5$
 Find $g(f(2))$

$$3(2n^2 + 5) + 2$$

$$6n^2 + 15 + 2$$

$$6n^2 + 17$$

$$6(2)^2 + 17$$

$$24 + 17 = 41$$

9. $g(x) = 2x - 2$
 $f(x) = x^2 + 3x$
 Find $(g \circ f)(-2 + x)$

$$2(x^2 + 3x) - 2$$

$$2x^2 + 6x - 2$$

$$2(-2 + x)^2 + 6(-2 + x) - 2$$

$$2(4 - 4x + x^2) + -12 + 6x - 2$$

$$8 - 8x + 2x^2 - 12 + 6x - 2$$

$$2x^2 - 2x + 6$$

10. $g(a) = 2a + 2$
 $h(a) = -2a - 5$
 Find $(g \circ h)(-4 + a)$

$$2(-2a - 5) + 2$$

$$-4a - 10 + 2$$

$$-4a - 8$$

$$-4(-4 + a) - 8$$

$$16 - 4a - 8$$

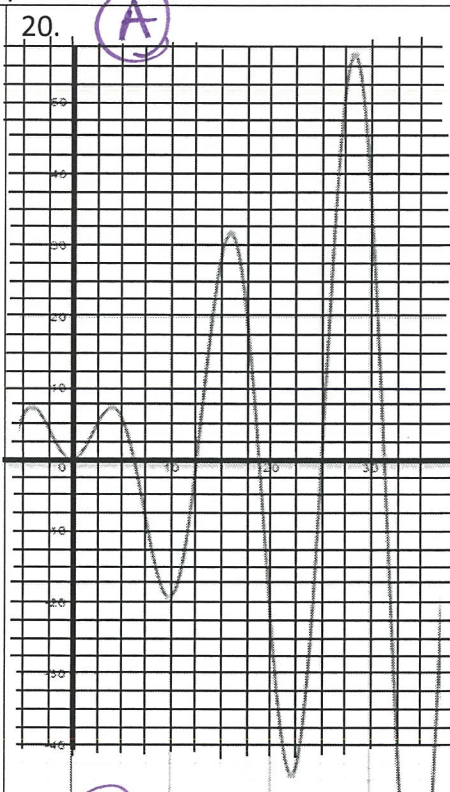
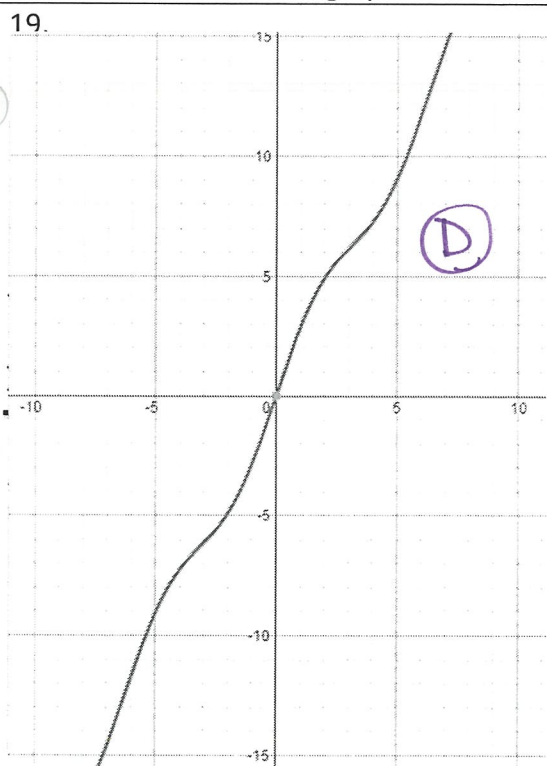
$$8 - 4a$$

Multiple Choice:

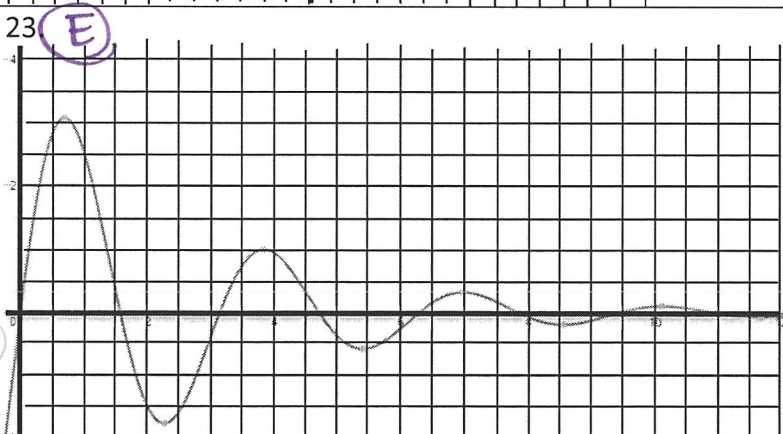
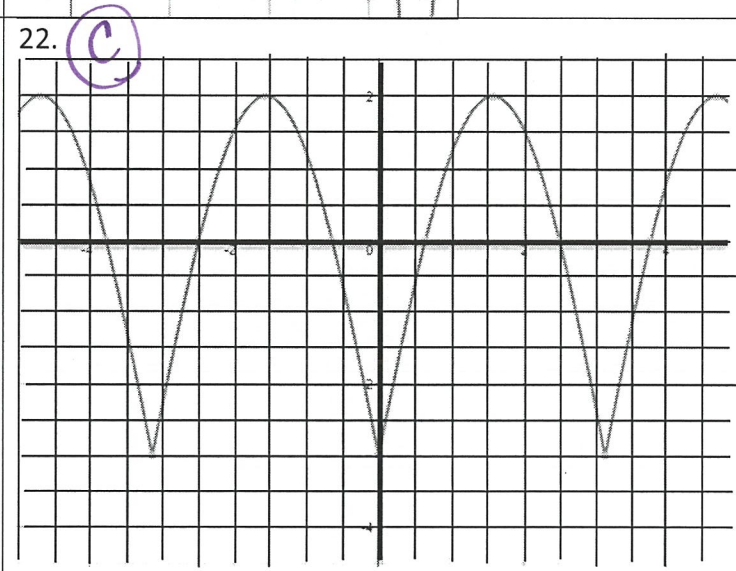
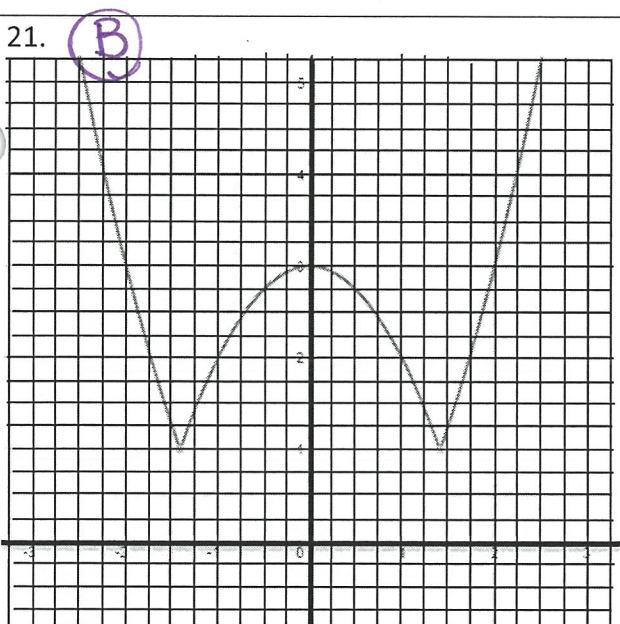
For #11-18, find $(f \circ g \circ h)(x)$

11. $f(x) = x-2$; $g(x) = x^2+1$; $h(x)=x-3$.
- a) $x^2-6x+10$ $g(h) = (x-3)^2 + 1$
 $x^2 - 6x + 9 + 1$
 $x^2 - 6x + 10$
b) x^2-6x+8 $(x^2-6x+10) - 2$
 $x^2 - 6x + 8$
c) $-x^2-4x+2$
d) x^2-4x+2
12. $f(x) = 2x-4$; $g(x) = x+7$; $h(x)=2x^2+3x+2$.
- a) $2x^2+6x+11$ $g(h) = 2x^2 + 3x + 2 + 7$
 $2x^2 + 3x + 9$
b) $2x^2-6x+14$
c) $4x^2+6x+14$ $2(2x^2+3x+9) - 4$
 $4x^2 + 6x + 18 - 4$
 $4x^2 + 6x + 14$
d) $2x^2+6x-14$
13. $f(x) = 3x^2-7$; $g(x) = x+8$; $h(x)=-4-x$.
- a) $-3x^2-48x-191$ $g(h) = -4-x + 8$
 $4-x$
b) $3x^2+48x+41$ $3(4-x)^2 - 7$
 $3(16-8x+x^2) - 7$
c) $-5-3x^2$ $48-24x+3x^2-7$
d) $3x^2-24x+41$ $3x^2 - 24x + 41$
14. $f(x) = x-4$; $g(x) = 3x^2+5x+7$; $h(x)=5-x$.
- a) $-3x^2+19x-30$ $g(h) = 3(5-x)^2 + 5(5-x) + 7$
 $3(25-10x+x^2) + 25-5x+7$
 $75-30x+3x^2+25-5x+7$
 $3x^2-35x+107$
b) $3x^2-19x+40$
c) $3x^2-19x+35$
d) $3x^2-35x+103$ $(3x^2-35x+107) - 4$
 $3x^2 - 35x + 103$
15. $f(x) = 2x+1$; $g(x) = x^2+4x+5$; $h(x)=5x$.
- a) $50x^2+40x+5$ $g(h) = (5x)^2 + 4(5x) + 5$
 $25x^2 + 20x + 5$
b) $50x^2+40x+11$ $2(25x^2+20x+5) + 1$
 $50x^2 + 40x + 10 + 1$
 $50x^2 + 40x + 11$
c) $x^2+11x+6$
d) $x^2+40x+11$
16. $f(x) = x^2+9x+2$; $g(x) = x-7$; $h(x)=x+5$.
- a) $x^2+5x+14$ $g(h) = x+5 - 7$
 $x-2$
b) x^2+5x-6
c) $x^2+5x-12$ $(x-2)^2 + 9(x-2) + 2$
 $x^2 - 4x + 4 + 9x - 18 + 2$
 $x^2 + 5x - 12$
d) x^2+9x
17. $f(x) = x+3$; $g(x) = 5x-9$; $h(x)=x^2-8x+7$.
- a) $5x^2-40x+29$ $g(h) = 5(x^2-8x+7) - 9$
 $5x^2 - 40x + 35 - 9$
 $5x^2 - 40x + 26$
b) $5x^2-14x-23$
c) $-5x^2-14x-23$
d) $5x^2+40x-26$ $(5x^2-40x+26) + 3$
 $5x^2 - 40x + 29$
18. $f(x) = x+8$; $g(x) = x^2+1$; $h(x)=3x^2$.
- a) $9x^4-9$ $g(h) = (3x^2)^2 + 1$
 $9x^4 + 1$
b) $9x^4+9$ $(9x^4+1) + 8$
 $9x^4 + 9$
c) $9x^4+1$
d) $4x^2+x+9$

For #19-23, match each graph with the correct equation.



- a.) $f(x) = 2x \cdot \sin\left(\frac{1}{2}x\right)$
- b.) $g(x) = |x^2 - 2| + 1$
- c.) $h(x) = 5|\sin x| - 3$
- d.) $j(x) = 2x + \sin x$
- e.) $k(x) = 4(0.7)^x \cdot \sin(2x)$



For #24-28, create a composite function given the components below.

$$f(x) = -3x - x$$

$$g(x) = |4x + 1|$$

$$h(x) = x^2 - 2$$

$$k(x) = 3x$$

$$m(x) = -x^3 - 3$$

$$p(x) = \sqrt[3]{x}$$

$$24. y = \sqrt[3]{(3x)^2 - 2}$$

$$p(h(k(x))) \text{ or } (p \circ h \circ k)(x)$$

$$25. y = -3(3x) - 3x$$

$$f(k(x)) \text{ or } (f \circ k)(x)$$

$$26. y = |4(-(x^2 - 2)^3 - 3) + 1|$$

$$g(m(h(x))) \text{ or } (g \circ m \circ h)(x)$$

$$27. y = -x - 3 \rightarrow -(\sqrt[3]{x})^3 - 3$$

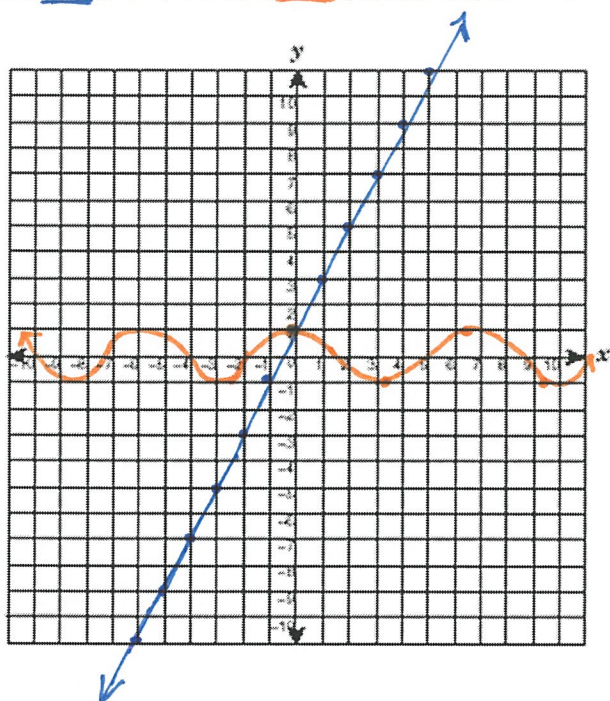
$$m(p(x)) \text{ or } (m \circ p)(x)$$

$$28. y = -3|4\sqrt[3]{x} + 1| - |4\sqrt[3]{x} + 1|$$

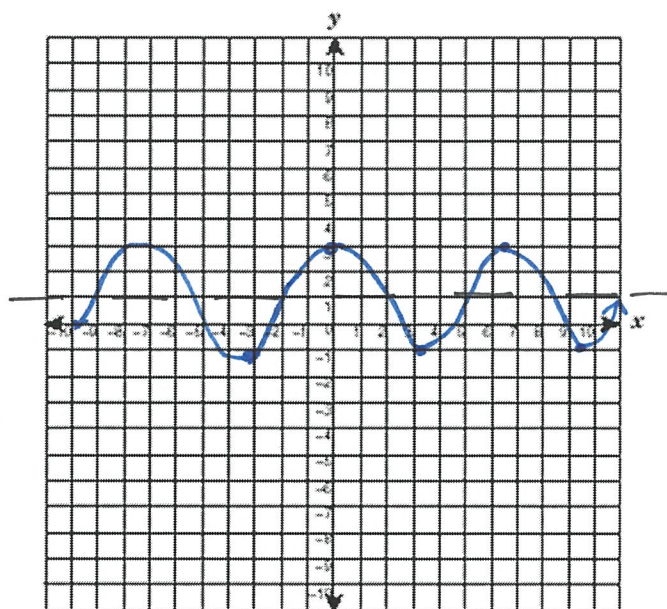
$$f(g(p(x))) \text{ or } (f \circ g \circ p)(x)$$

For #29-32, sketch the graph of the following functions:

29. $f(x) = 2x + 1$ and $g(x) = \cos x$

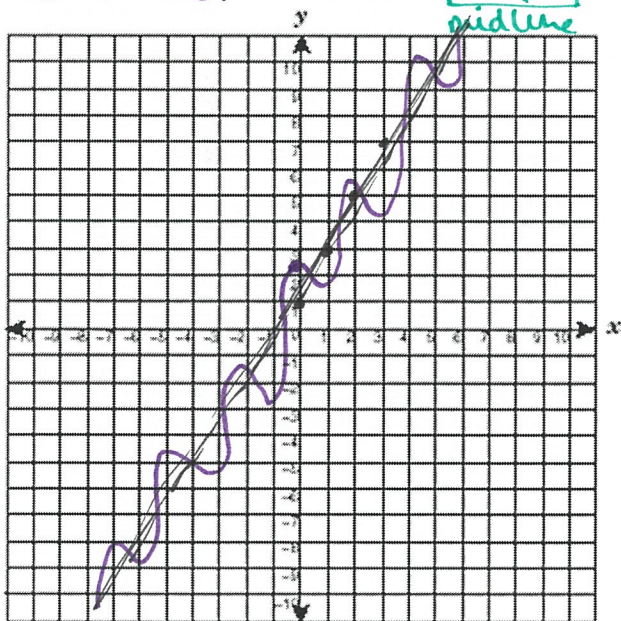


30. $f(g(x)) = 2(\cos x) + 1$



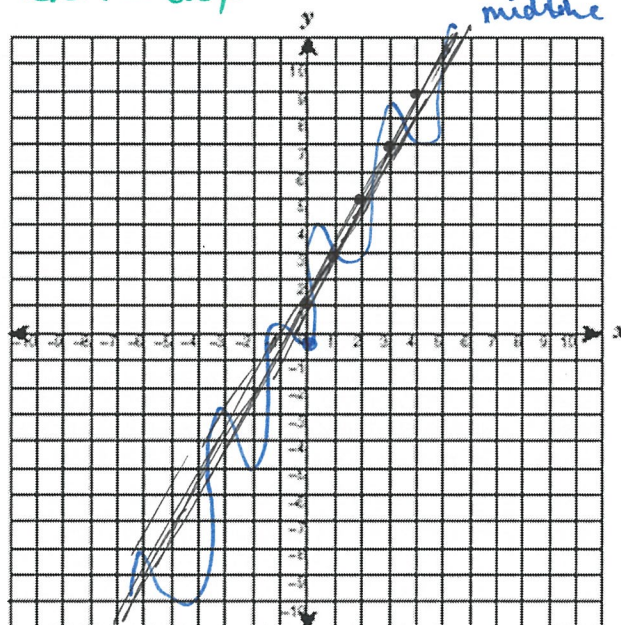
31. $(f + g)(x)$

$2x + 1 + \cos x \rightarrow \cos x + \underbrace{2x + 1}_{\text{midline}}$



32. $(f - g)(x)$

$2x + 1 - \cos x \rightarrow -\cos x + \underbrace{2x + 1}_{\text{midline}}$



For #33-39, use the table to find the indicated function values.

x	$f(x)$	$g(x)$
-2	0	-8
-1	5	4
0	2	-1
1	-1	0
2	3	2
3	12	6

33. $f(g(-2))$

$f(-8)$
undefined

34. $f(g(0))$

$f(-1)$
5

35. $g(f(-2))$

$g(0)$
-1

36. $g(f(0))$

$g(2)$
2

37. $g(f(-1))$

$g(5)$
undefined

38. $g(g(-2))$

$g(-8)$
undefined

39. $f(f(2))$

$f(3)$
12

For #40-43, use the graph at the right to find the indicated values.

40. $h(x) = f(g(x))$

Find $h(-3.14)$

$f(g(-3.14))$
 $f(0)$
0

41. $h(x) = f(g(x))$

Find $h(1.57)$

$f(g(1.57))$
 $f(1)$
-1

42. $k(x) = g(f(x))$

Find $k(8)$

$g(f(8))$
 $g(-8)$
 ≈ -1

43. $m(x) = f(f(x))$

Find $m(-2)$

$f(f(-2))$
 $f(2)$
-2

