Functions. Form A

1. Given $\sqrt{x^3}-1$, what is $f(2)$?

(A) $\sqrt{7}$
(B) $\sqrt{8}-1$
(C) 7
(D) $\sqrt{2}-1$
(E) $2\sqrt{3}$

$f(2)$ means replace every x with 2

$f(2) = \sqrt{2^3} - 1 = \sqrt{8} - 1$

2. Given $f(x)=\sqrt{x^2+1}$, $g(x)=3x$. What is $f(g(x))$?

(A) $3x+1$
(B) $\sqrt{3x}+1$
(C) 10
(D) $\sqrt{9x^2+1}$
(E) $\sqrt{18x^2+1}$

$f(g(x))$ means replace ever x in $f(x)$ with $g(x)=3x$

$f(g(x)) = \sqrt{(3x)^2+1} = \sqrt{9x^2+1}$

3. Given $f(x)=|1-x|$, $g(x)=5x$. What is $f(g(-2))$?

(A) 9
(B) -9
(C) 11
(D) -11
(E) 10

$g(-2) = 5(-2) = -10$

$f(g(-2)) = f(-10) = |1-(-10)| = |1+10| = |11| = 11$

4. Given $f(x)$ *below*. What is $f(3)$?

(A) 9
(B) -9
(C) 8
(D) 17
(E) Undefined

$$f(x) = \begin{cases} 3x-1 & -5 \le x < 0 \\ x^2 & 0 \le x \le 7 \end{cases}$$

$x=3$ is in this interval — use this

$f(3) \rightarrow x=3$

Use $f(x)=x^2$

So $f(3)=(3)^2=9$

5. Given $f(x)$ *below*. What is $f(0)$?

(A) -5
(B) -1
(C) 1
(D) $\sqrt{8}$
(E) undefined

$$f(x) = \begin{cases} x-1 & -5 \le x < 0 \\ \sqrt{x+1} & 0 \le x \le 7 \end{cases}$$

Use this since $x=0$ is in this interval

$f(0) = \sqrt{0+1} = \sqrt{1} = 1$

6. Given that the function f is defined as $f(x) = 3 - 2x$. If the domain of the function is given by $\{-1,0,2\}$, What is the range of function f?

(A) $\{1,3,-1\}$
(B) $\{-1,0,-1\}$
(C) $\{5,0,5\}$
(D) $\{-1,0,2\}$
(E) $\{5,3,-1\}$

Domain x	Range $f(x) = 3-2x$
-1	$f(-1) = 3-2(-1) = 3+2 = 5$
0	$f(0) = 3-2(0) = 3-0 = 3$
2	$f(2) = 3-2(2) = 3-4 = -1$

Range

7. Given that the function f is defined as $f(x) = \frac{2}{1-2x}$. What is the domain of function f?

(A) $x \neq \frac{1}{2}$
(B) $x = \frac{1}{2}$
(C) $x = 0$
(D) $x \neq 0$
(E) undefined

Can't have zero in the denominator
so set denominator $= 0$ and solve for x

$1-2x = 0$

$1 = 2x \Rightarrow x = \frac{1}{2}$

So we can't use $x = \frac{1}{2}$ because it will make the denominator zero
Therefore the domain is $x \neq \frac{1}{2}$

8. Given that the function f is defined as $f(x) = \sqrt{x-1}$. What is the domain of function f?

(A) $x = 1$
(B) $x \neq 1$
(C) $x \geq 1$
(D) $x < 1$
(E) undefined

Can't have a negative number under $\sqrt{}$
so we set what's under $\sqrt{}$ to be positive or zero ≥ 0

So $x - 1 \geq 0$

$x \geq 1$

9. In the standard (x, y)coordinate plane, what is the y-intercept of the graph of the function $f(x) = 2x - 5$?

this is a straight line

$f(x) = mx + b$ (m: slope, b: y-intercept)

(A) 0
(B) -7
(C) 2
(D) -5
(E) 5

so $f(x) = 2x - 5$ → slope: 2, y-intercept: -5

10. The function f is defined by the table below. What is $f(-1) + f(3)$?

x	-2	-1	0	1	2	3
f(x)	4	1	0	1	4	9

(A) 2
(B) 8
(C) 13
(D) -5
(E) 10

$f(-1) = 1 + f(3) = 9 = 10$

11. The function f is defined by the table below. What is the domain of the function?

x	-2	-1	0	1	2
f(x)	4	1	0	1	4

Domain ← x values; Range ← f(x) values

so $\{-2, -1, 0, 1, 2\}$

(A) $\{-2,4,-1,1,0,0,1,1,2,4\}$
(B) $(4,1,0,1,4\}$
(C) $\{-2,4\}$
(D) $\{-2,-1,0,1,2\}$
(E) [-2,4]

12. The function f is defined by the table below. What is the range of the function?

x	0	1	2	3
f(x)	-2	0	2	4

Domain ← x values; Range ← y values

(A)) $\{0,1,2,3\}$
(B)) $\{-2,0,2,4\}$
(C)) $\{0,4\}$

(D) [0,4]
(E)) {0, −2,3,4}

13. What are the amplitude and period of the function $f(t) = 2\cos\left(\frac{1}{2}t\right)$?

(A) Amplitude is 2, Period is $\frac{\pi}{2}$
(B) Amplitude is 2, Period is 4π
(C) Amplitude is 2, Period is 2π
(D) Amplitude is 1, Period is 4π
(E) Amplitude is 2, Period is $\frac{\pi}{2}$

For any function $f(t) = A\cos(\omega t)$
Amplitude ~~Period~~ $= A$ and Period $= \frac{2\pi}{\omega}$
For $f(t) = 2\cos\left(\frac{1}{2}t\right)$
Amplitude $= 2$ Period $= \frac{2\pi}{\frac{1}{2}} = 4\pi$

14. The function $f(x) = x^2$ is a parabola in the standard (x, y) coordinate plane with vertex at the origin and it opens upward. What is the equation of the parabola if it's shifted up by 2 units and to the right by 3 units? → replace x with x−3 add 2

(A) $f(x) = (x-2)^2 + 3$
(B) $f(x) = (x+2)^2 - 3$
(C) $f(x) = (x-3)^2 + 2$
(D) $f(x) = (x+3)^2 + 2$
(E) $f(x) = (x-3)^2 - 2$

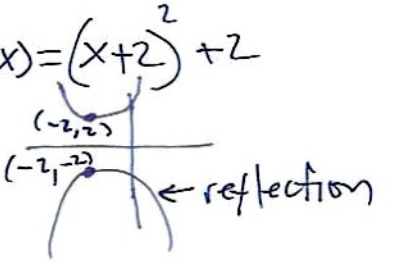
So for $f(x) = x^2$
① Add 2 $\Rightarrow x^2 + 2$
② replace x with x−3 $\Rightarrow (x-3)^2$
So $f(x) = (x-3)^2 + 2$

15. The function $f(x) = (x+2)^2 + 2$ is a parabola in the standard (x, y) coordinate plane. What is the vertex if the parabola is reflected about the x-axis?

↳ vertex is at (−2, 2)

(A) (−2, −2)
(B) (2, −2)
(C) (−2,2)
(D) (−2, −2)
(E) (0, −2)

$f(x) = (x+2)^2 + 2$



16. The function f and g is defined by the table below. What *is* $f(g(2))$?

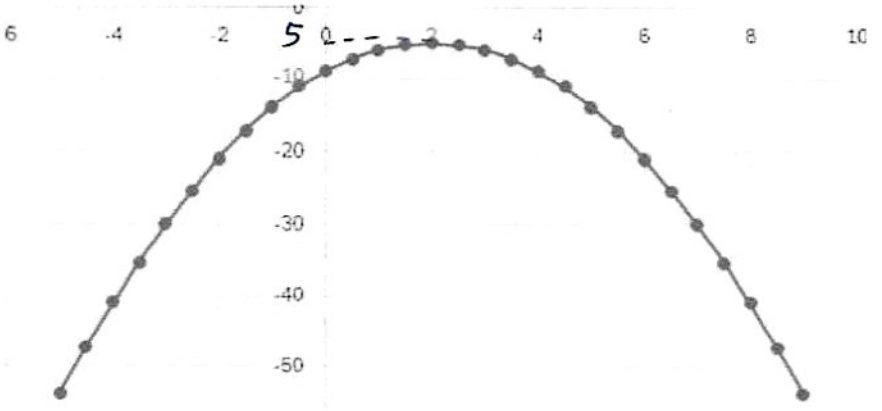
x	0	1	2	3	4	5
f(x)	-2	0	2	4	6	8
g(x)	0	1	4	9	16	25

f(4) = 6
g(2) = 4
f(g(2)) = f(4)

(A) 2
(B) 6

(C) 16
(D) 8
(E) 4

17. The graph of a function a parabola in the standard (x, y) coordinate plane is given below. The graph is represented by which equation?



vertex is at $(2, -5)$

(A) $f(x) = (x-2)^2 - 10$
(B) $f(x) = (x+2)^2 - 5$
(C) $f(x) = -(x-2)^2 - 5$
(D) $f(x) = -(x-10)^2 - 5$
(E) $f(x) = -(x+2)^2 - 5$

$f(x) = -(x-2)^2 - 5$

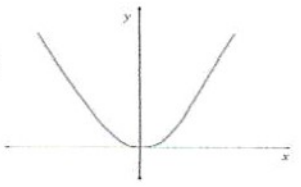
shifted down by 5

shifted by 2 to the right

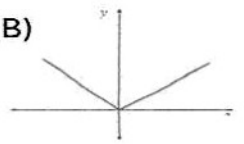
inverted parabola

18. Which of the graphs below in the standard (x, y) plane coordinate is NOT a function?

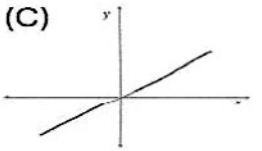
(A)



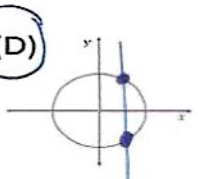
(B)



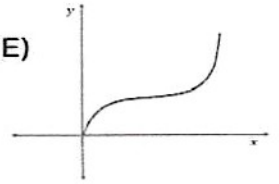
(C)



(D)



(E)



fails the vertical line test

19. For $f(x) = 2x + 1$, what is $f(x + h)$?

(A) $2x + 2h + 1$

(B) 0

(C) $2x + h + 1$

(D) $x + h + 1$

(E) $2x^2 + 2h^2 + 1$

replace every x in f(x) with x+h

so $f(x+h) = 2(x+h)+1$

$= 2x + 2h + 1$

20. What is the period of the function $f(t) = 2\sin(t + 3)$ in degrees?

(A) 90°

(B) 180°

(C) 270°

(D) 45°

(E) 360°

for any function $f(t) = A\sin(\omega t + d)$

$\text{period} = \frac{2\pi}{\omega}$

for $f(t) = 2\sin(t+3)$ $\omega = 1$

$\text{period} = \frac{2\pi}{1} = 2\pi = 360°$

1. B 11. D
2. D 12. B
3. C 13. B
4. A 14. C
5. C 15. D
6. E 16. B
7. A 17. C
8. C 18. D
9. D 19. A
10. E 20. E