

PMATH 12 - CHAPTER 4 - PRETEST

signature _____

Multiple Choice - PART 1 - NON-CALCULATOR - 10 MINUTES (#1-5)

CIRCLE the choice that best completes the statement or answers the question.

1. Given $f(x) = x - 1$ and $g(x) = 3x^2 + 2$, what is an explicit equation for $p(x) = f(x) \cdot g(x)$?

A. $p(x) = \cancel{4x^3} + 3x^2 + 2x - 2$

B. $p(x) = 3x^2 + x + 1$

C. $p(x) = 3x^2 - x - 2$

D. $p(x) = 3x^3 - 3x^2 + 2x - 2$

$(x-1)(3x^2+2)$
 $3x^3 - 3x^2 + 2x - 2$

2. Given $f(x) = x + 2$ and $g(x) = x^2 - 25$, what is the domain of $q(x) = \frac{f(x)}{g(x)}$?

A. $x \neq 25$

B. $x \neq 5, x \neq -5$

C. $x \neq -2$

D. $x \in \mathbb{R}$

3. Given $h(x) = 5x^2 + 2x - 3$, which pair of equations below are possible equations for $f(x)$ and $g(x)$ so that $h(x) = f(x) - g(x)$?

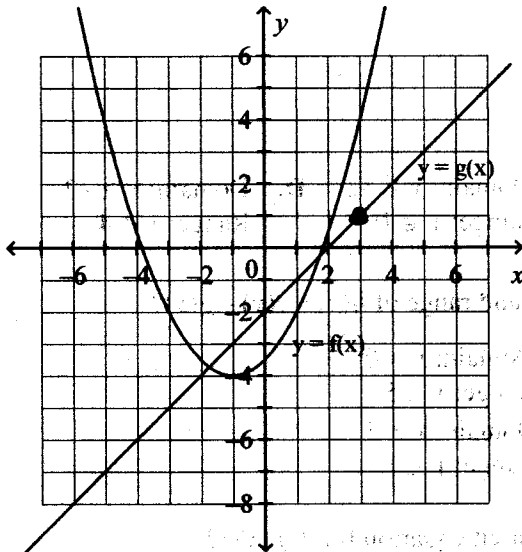
A. $f(x) = 5x^2$
 $g(x) = 2x - 3$

C. $f(x) = 4x^2$
 $g(x) = -x^2 - 2x - 3$

B. $f(x) = 4x^2$
 $g(x) = x^2 + 2x - 3$

D. $f(x) = 5x^2$
 $g(x) = -2x + 3$

4. Given the graphs of $y = f(x)$ and $y = g(x)$, what is the value of $f(g(3))$?



$x=3 \rightarrow g \rightarrow y=1$
 \downarrow
 $x=1 \rightarrow f \rightarrow y=-2$

A. 4

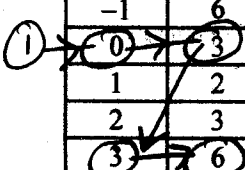
B. -2

C. 2

D. -4

5. Use these tables. What is the value of $f(f(0))$?

x	$f(x)$
-3	18
-2	11
-1	6
0	3
1	2
2	3
3	6



A. -2

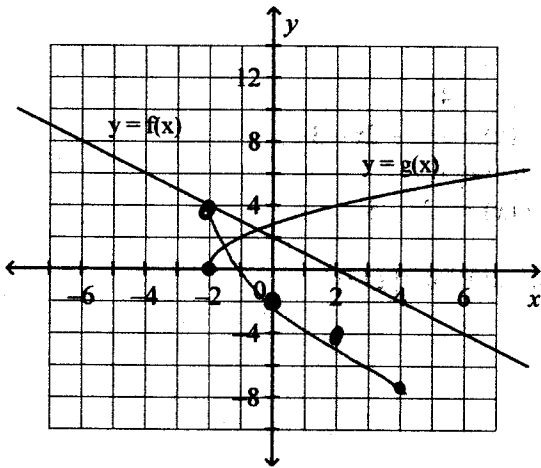
B. 6

C. 2

D. 0

MULTIPLE CHOICE - PART 2 - CALCULATOR may be used after 10 minutes

6. Use the graphs of $y = f(x)$ and $y = g(x)$. What are the domain and range of $y = f(x) - g(x)$?



x	f	g	$f-g$
-2	4	0	4
0	2	3	-1
2	0	4	-4
4	-2	5	-7

A. Domain: $x \in \mathbb{R}$
Range: $y \leq -2$

B. Domain: $x \leq -2$
Range: $y \leq 4$

C. Domain: $x \geq -2$
Range: $y \in \mathbb{R}$

**D. Domain: $x \geq -2$
Range: $y \leq 4$**

7. Given $f(x) = |x - 5|$ and $g(x) = \frac{1}{x}$, what is the domain and range of $h(x) = f(x) + g(x)$?

**A. Domain: $x \neq 0$
Range: $y \in \mathbb{R}$**

B. Domain: $x > 5$
Range: $y \leq 5$

C. Domain: $x \neq 0$
Range: $y \leq 5$

D. Domain: $x > 5$
Range: $y \in \mathbb{R}$

8. Given $f(x) = \sqrt{4-x}$ and $g(x) = 3-5x$, what is an explicit equation for $f(g(x))$?

A. $f(g(x)) = 3 - \sqrt{4-5x}$

B. $f(g(x)) = 1 - \sqrt{4-5x}$

C. $f(g(x)) = \sqrt{1-5x}$

D. $f(g(x)) = \sqrt{5x+1}$

$$\sqrt{4 - (3 - 5x)}$$

$$\sqrt{4 - 3 + 5x}$$

$$\sqrt{1 + 5x}$$

9. The function $h(x) = g(f(x))$ is the composite of $f(x) = 2-x$ and $g(x) = \frac{1}{\sqrt{x}}$.

$$\frac{1}{\sqrt{2-x}}$$

$$\begin{aligned} 2-x &\geq 0 \\ 2 &\geq x \\ x &\leq 2 \\ \hline x &< 2 \\ \text{denom} \end{aligned}$$

What is the domain of $h(x)$?

- A. $-2 < x < 0$ **B.** $x < 2$ C. $x < -2$ or $x > 0$ D. $x > 0$

10. Given $f(x) = \sqrt{2-x}$ and $g(x) = x^2 + 6x - 3$, which is an explicit equation for the composite function $h(x) = g(f(x))$, and what is its domain?

$$\begin{aligned} (\sqrt{2-x})^2 + 6\sqrt{2-x} - 3 \\ = 2-x + 6\sqrt{2-x} - 3 \\ = -1-x + 6\sqrt{2-x} \end{aligned}$$

$$\begin{aligned} 2-x &> 0 \\ 2 &\geq x \\ x &\leq 2 \end{aligned}$$

- A. $h(x) = \sqrt{-x^2 - 6x + 5}$
 $x \geq 0$
- B. $h(x) = -1-x$
 $x \in \mathbb{R}$
- C. $h(x) = \sqrt{-1-x}$
 $x \leq -1$
- D.** $h(x) = -1-x + 6\sqrt{2-x}$ ✓
 $x \leq 2$

Short Answer - Show your work

1. Given $f(x) = 3x^2 - 1$, $g(x) = x - 4$, and $h(x) = 1 - x^3$, write an explicit equation for $k(x) = f(x) \cdot g(x) - h(x)$, then state its domain.

$$\begin{aligned} (3x^2-1)(x-4) - (1-x^3) \\ 3x^3 - 12x^2 - x + 4 - 1 + x^3 \\ = 4x^3 - 12x^2 - x + 3 \end{aligned} \quad \boxed{x \in \mathbb{R}}$$

2. Given $f(x) = \sqrt{x+4}$ and $g(x) = (x-9)^2$, write an explicit equation for $q(x) = \frac{f(x)}{g(x)}$, then determine its domain.

$$\frac{\sqrt{x+4}}{(x-9)^2} \rightarrow \begin{aligned} x+4 &\geq 0 \\ x &\geq -4 \end{aligned}$$

$$\rightarrow \begin{aligned} x-9 &\neq 0 \\ x &\neq 9 \end{aligned}$$

3. Given the functions $f(x) = 2x + 2$ and $g(x) = \sqrt{x+3}$, determine an explicit equation for $g(f(x))$, then state its domain.

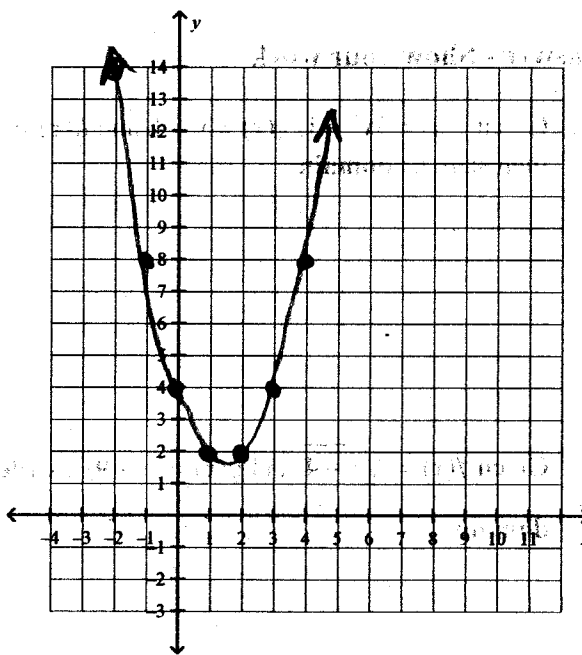
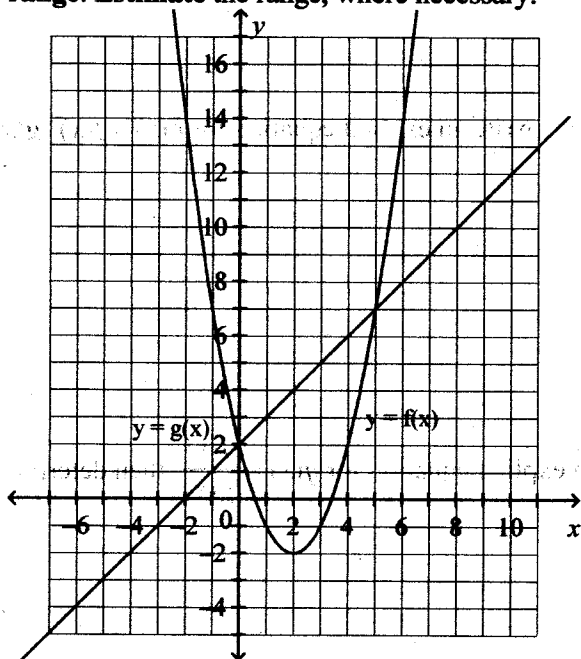
$$\begin{aligned} \sqrt{2x+2+3} \\ = \sqrt{2x+5} \end{aligned} \quad \begin{aligned} 2x+5 &\geq 0 \\ x &\geq -\frac{5}{2} \end{aligned}$$

4. Given the functions $f(x) = 2x - 4$ and $g(x) = x^2 - 1$, determine each value below.

a) $g(f(1))$ $f(1) = 2(1) - 4 = 2 - 4 = -2$ $\rightarrow g(-2) = (-2)^2 - 1 = 4 - 1 = \boxed{3}$

b) $g(g(1))$ $g(1) = 1^2 - 1 = 1 - 1 = 0$ $\rightarrow g(0) = 0^2 - 1 = 0 - 1 = \boxed{-1}$

5. Use the graphs of $y = f(x)$ and $y = g(x)$ to sketch the graph of $y = f(x) + g(x)$, then identify its domain and range. Estimate the range, where necessary.



x	f(x)	g(x)	f+g	
-2	14	0	14	domain of new graph $x \in \mathbb{R}$
-1	7	1	8	
0	2	2	4	range of new graph $y \geq 1.75$ approx
1	-1	3	2	
2	-2	4	2	
3	-1	5	2	
4	2	6	8	

6. Given $f(x) = \frac{x-2}{4}$ and $g(x) = 2x^2 + 4$, determine an explicit equation for $f(g(x))$, then state its domain and range.

$$\frac{2x^2 + 4 - 2}{4} = \frac{2x^2 + 2}{4} = \boxed{\frac{x^2 + 1}{2}}$$

Domain $x \in \mathbb{R}$

Range $y \geq \frac{1}{2}$ (g.c.)

Problem - Show your work

1. Given $q(x) = x^2 - 1$, write explicit equations for two functions $f(x)$ and $g(x)$ so that $q(x) = \frac{f(x)}{g(x)}$. Explain your strategy.

$$q(x) = \frac{f(x)}{g(x)} = \frac{(x^2 - 1)(f(x))}{(g(x))}$$

Many answers

eg:
$$\begin{aligned} f(x) &= (x+1)(x-1) \\ g(x) &= 1 \end{aligned}$$

eg:
$$\begin{aligned} f(x) &= 7(x^2 - 1) \\ g(x) &= 7 \end{aligned}$$

2. Given $f(x) = 2x + 1$ and $g(x) = x^3 - 3$, determine an explicit equation for each composite function, then state its domain and range.

a) $f(g(x))$

domain

range

$$2(x^3 - 3) + 1$$

$$2x^3 - 6 + 1$$

$$\boxed{2x^3 - 5}$$

$$x \in \mathbb{R}$$

$$y \in \mathbb{R}$$

b) $g(f(x))$

domain

range

$$(2x+1)^3 - 3$$

$$(2x+1)(2x+1)(2x+1) - 3$$

$$(4x^2 + 4x + 1)(2x+1) - 3$$

$$8x^3 + 8x^2 + 2x$$

$$4x^2 + 4x + 1 - 3$$

$$\boxed{8x^3 + 12x^2 + 6x - 2}$$

$$x \in \mathbb{R}$$

$$y \in \mathbb{R}$$