vM30-1 Function Operations & Polynomials Quiz

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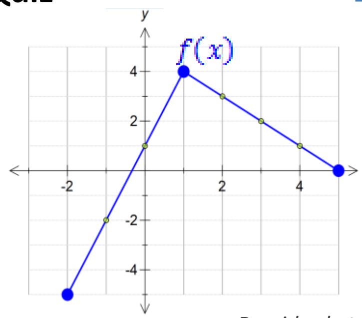
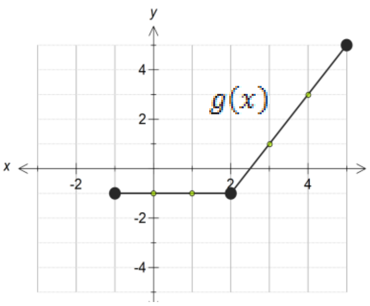
Name: ____________________

NO CALCULATORS are allowed for this quiz!





1. Given the graphs of $f(x)$ and $g(x)$ on the right…

(a) State the domain of $h(x) = f(x) - g(x)$

1 $-1 \le x \le 5$

or… $[-1, 5]$

(b) State the indicated values in the blanks provided

3

4

i) $f(3)$ $\underline{2}$

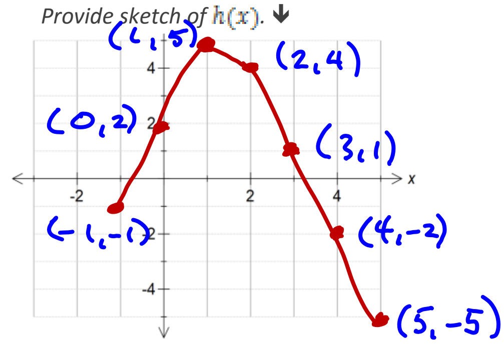
ii) $f \circ g(0)$ $\underline{-2}$ $g(0) = -1$, $f(-1) = -2$

x iii) $f \circ f \circ g(0)$ $\underline{-5}$ $f \circ g(0) = -2$ $f(-2) = -5$

(c) Provide a sketch of $h(x) = (f - g)(x)$ on the grid provided. →

1

Provide sketch of $h(x)$. ↓



2. Two functions are defined by $f(x) = x^2 - 1$ and $g(x) = 2x + 3$.

(a) State the expression *(fully simplified)* for a function $(f + g)(x)$ and state the **domain**.

2 $\underbrace{x^2 - 1}_{f} + \underbrace{2x + 3}_{g}$

$\underline{x^2 + 2x + 2}$ Simplified $(f + g)(x)$

$(-\infty, \infty)$
$x \in \mathbb{R}$

$\underline{\mathbb{R}}$ DOMAIN of $(f + g)(x)$

(b) State the expression *(do not simplify)* for a function $\left(\frac{f}{g}\right)(x)$ and state the **domain**.

5

2 Domain: $2x + 3 \ne 0$

$\frac{2x}{2} \ne \frac{-3}{2}$

$\underline{\dfrac{x^2 - 1}{2x + 3}}$ Non-simplified $\left(\frac{f}{g}\right)(x)$

$\underline{x \ne -3/2}$ DOMAIN of $\left(\frac{f}{g}\right)(x)$

(c) State the expression *(simplified)* for a function $f \circ g \circ g(x)$.

1 $f(g(g(x)))$

$f(g(2x + 3))$

$f(2(2x + 3) + 3)$

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

$(4x + 9)^2 - 1$

$16x^2 + 72x + 81 - 1$

$(4x + 9)^2 - 1$

$\underline{16x^2 + 72x + 80}$ Simplified $f \circ g \circ g(x)$

3. Two functions are defined by $f(x) = \sqrt{x - 1}$ and $g(x) = x^2$. Determine the expression for a function $f \circ g(x)$, and state the **domain**.

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

$\underline{\sqrt{x^2 - 1}}$ $f \circ g(x)$

$(-\infty, -1] \cup [1, \infty)$

$\underline{x \le -1 \text{ or } x \ge 1}$ DOMAIN of $f \circ g(x)$

4. Two functions are defined by $f(x) = \sqrt{x - 1}$ and $g(x) = x^2 - x$. Determine the value of $g \circ f(10)$.

1 $f(10) = \sqrt{10 - 1}$
$= \sqrt{9}$
$= 3$

So, $g(3) = (3)^2 - (3)$
$= 9 - 3$
$= 6$

$\underline{6}$ Value of $g \circ f(10)$

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5. Below is a list of functions. Indicate each polynomial functions but placing a "P" beside it. Then, indicate the degree of the polynomial function.

$f(x) = 3x^2 + 5x - 7$
P Degree 2

$y = 5x(x-2)(x+3)$
P Degree 3

$y = 3\sqrt{x-1} + 2$ X

3

$y = \sqrt{5}x - 7$
P Degree 1

$y = 3x^2 + 2x^{-1}$ X

$y = 6x^2(x+5)^7$
P Degree 9

5. For each provided equation on the left, math with the appropriate numbered graph. ***Note:*** *There are more graphs than equations – some graphs are "extras"!*

a) $f(x) = 3x^2 + 5x - 7$ 4

b) $2y = 5x + 8$ 6
$y = 2.5x + 4$

c) $y = x^3 - 4x^2 + x + 6$ 1

d) $y = -(x+1)(x+2)(x-3)$ 9

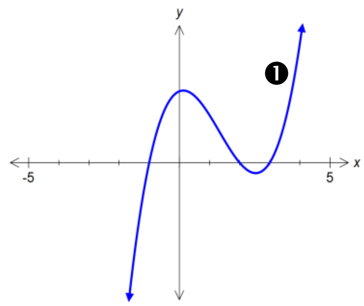
8

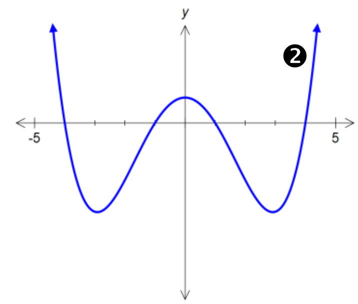
e) $f(x) = x^4 - 17x^2 + 16$ 2

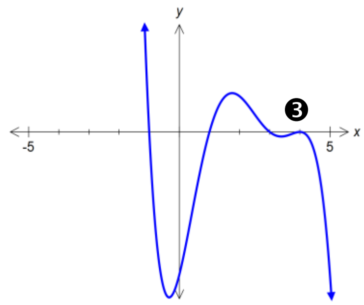
f) $f(x) = -2(x+6)(x-1)(x-3)(x-4)^2$ 3

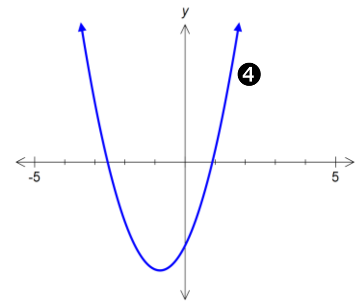
g) $y = -x^6 + 5x^5 + 7x^4 - 53x^3 + 18x^2 + 72x$ 10

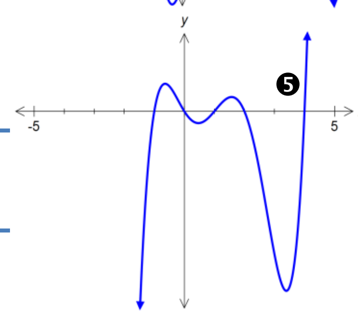
h) $y = 2x^5 - 12x^4 + 14x^3 + 12x^2 - 16x$ 5

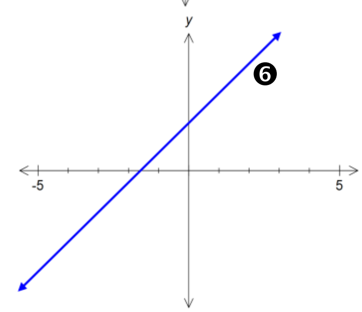


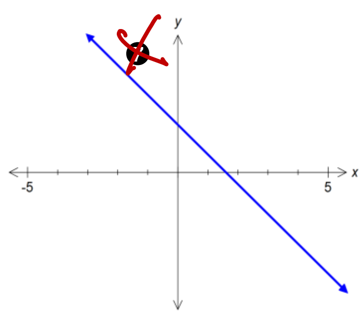
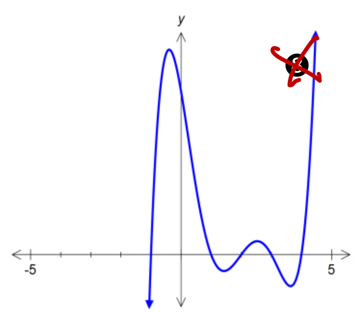
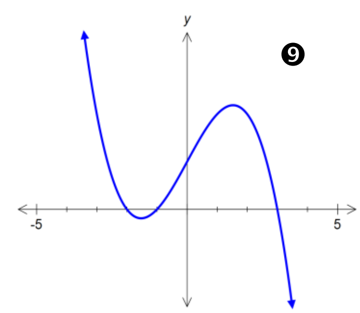


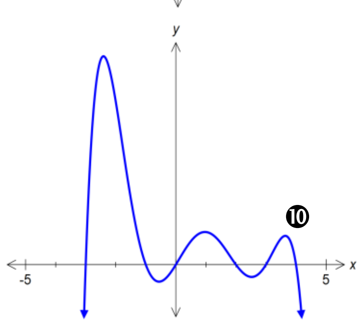


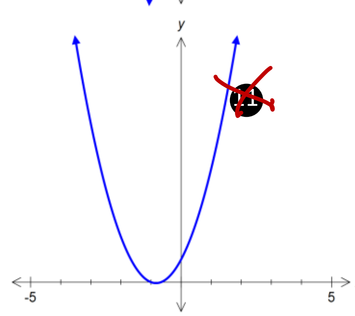
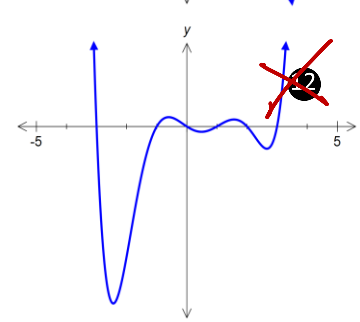








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M30-1 Polynomials Quiz PART 2 9 ___ total ___ % **Name:** ____________

1. Determine the value of k such that when $f(x) = x^4 + kx^3 - 3x - 5$ is divided by $x - 3$, the remainder is -14

$\rightarrow P(3) = -14$

2

$(3)^4 + k(3)^3 - 3(3) - 5 = -14$

$81 + 27k - 9 - 5 = -14$

$27k = -81$

$k = -3$

2. Use the factor / remainder theorem to show that:

(a) $(x + 3)$ is a factor of $P(x) = x^3 - 7x + 6$

Show $P(-3) = 0$

(division gives no remainder)

2

$P(-3) = (-3)^3 - 7(-3) + 6$

$= -27 + 21 + 6$

$= 0$ ✓ FACTOR

(b) $(x - 1)$ is NOT a factor of $f(x) = 2x^3 + 9x^2 + 7x - 6$

Show $P(1) \neq 0$

$2(1)^3 + 9(1)^2 + 7(1) - 6$

$= 2 + 9 + 7 - 6$

$= 12 \leftarrow$ that's not zero!

NOT a Factor

3. Use synthetic division to find the result when $P(x) = x^3 - 3x^2 - 4x + 12$ is divided by $x - 2$.

$$\begin{array}{r|rrrr} 2 & 1 & -3 & -4 & 12 \\ & \downarrow & 2 & -2 & -12 \\ \hline & 1 & -1 & -6 & 0 \end{array}$$

$\leftarrow$ Remainder

2

Result: $x^2 - x - 6$

6

4. FULLY FACTOR $P(x) = x^3 - 4x^2 + x + 6$ using an algebraic method. Show all steps / reasoning.

Potential zeros: $\pm 1, \pm 2, \pm 3, \pm 6$

3

$P(1) = (1)^3 - 4(1)^2 + (1) + 6 \neq 0$

$P(-1) = (-1)^3 - 4(-1)^2 + (-1) + 6 = 0$ ✓ Factor

So, $(x+1)$ is a factor!

Find remaining factors by dividing

$(x^3 - 4x^2 + x + 6) \div (x+1)$

$$
\begin{array}{r|rrrr}
-1 & 1 & -4 & 1 & 6 \\
 & & -1 & 5 & -6 \\
\hline
 & 1 & -5 & 6 & 0 \leftarrow R
\end{array}
$$

$\underbrace{1 \quad -5 \quad 6}_{x^2 - 5x + 6}$

So, $P(x) = (x^2 - 5x + 6)(x+1)$

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