More precal practice
Nov. 10, 2021

Do all work in notebook!
Show all work!

Find the the value of (a) $f \circ g$ and (b) $g \circ f$, then (c) find the domain for $f \circ g$:

1) a. $(f \circ g)(x) = \boxed{\sqrt{4x^2 - 7}}$

b) $(g \circ f)(x) = 4(\sqrt{x-7})^2 = \boxed{4(x-7) = 4x - 28}$

c) $4x^2 - 7 \geq 0 \rightarrow 4x^2 \geq 7 \rightarrow$

$x^2 \geq \frac{7}{4} \rightarrow x \geq \sqrt{7/4} \rightarrow x \geq \frac{\sqrt{7}}{\sqrt{4}} = \frac{\sqrt{7}}{2}$

$x \geq \frac{\sqrt{7}}{2}$

2) a. $(f \circ g)(x) = \boxed{\sqrt{\frac{x}{2} + 3}}$

b. $(g \circ f)(x) = \boxed{\frac{\sqrt{x+3}}{2}}$

c. $\frac{x}{2} + 3 \geq 0 \rightarrow x + 6 \geq 0 \rightarrow$

$\boxed{x \geq -6}$

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1. $f(x) = \sqrt{x-7},\ g(x) = 4x^2$

2. $f(x) = \sqrt{x+3},\ g(x) = \dfrac{x}{2}$

3. $f(x) = x+2,\ g(x) = \dfrac{1}{x^2-4}$

3. a) $(f \circ g)(x) = \boxed{\dfrac{1}{x^2-4} + 2}$

b) $(g \circ f)(x) = \dfrac{1}{(x+2)^2-4} = \boxed{\dfrac{1}{x^2+4x}}$

c. $x^2 - 4 > 0 \rightarrow x^2 > 4$

$x > 2$

Identify the vertex and x-intercepts for:

4. $f(x) = x^2 + 8x + 11$

5. $f(x) = -(x^2 - 2x - 15)$

6. $f(x) = 4x^2 + 24x - 41$

4. Vertex

	x	$+4$
x	x^2	$+4x$
$+4$	$+4x$	$+16$

$f(x) = (x^2 + 8x + 16) - 16 + 11$

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

Vertex: $(-4, -5)$

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roots: $a=1, b=8, c=11$

$$x = \frac{-8 \pm \sqrt{8^2 - 4(1)(11)}}{2 \cdot 1} =$$

$$\frac{-8 \pm \sqrt{64 - 44}}{2} = \frac{-8 \pm \sqrt{20}}{2}$$

$$\sqrt{20} = \sqrt{4 \cdot 5} = \sqrt{4} \cdot \sqrt{5} = 2\sqrt{5}$$

$$x = \frac{-8 \pm 2\sqrt{5}}{2} = -4 \pm \sqrt{5}$$

$$x = -4+\sqrt{5},\ -4-\sqrt{5}$$

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5. $f(x) = -(x^2 - 2x - 15)$

Vertex:

$$\begin{array}{c|c|c} & x & -1 \\ \hline x & x^2 & -x \\ \hline -1 & -x & +1 \end{array}$$

$f(x) = -[(x-1)^2 - 1 - 15]$

$= -[(x-1)^2 - 16]$

$= -(x-1)^2 + 16$

$\boxed{\text{Vertex: } (1, 16)}$

roots: $-(x^2 - 2x - 15)$

$+3 \quad -5 = -2$

$= -(x+3)(x-5)$

$$\boxed{\begin{array}{l} x = -3 \\ x = 5 \end{array}}$$

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6. $f(x) = 4x^2 + 24x - 41$

Vertex:

$$f(x) = 4[x^2 + 6x - 10.25]$$

	x	$+3$
x	x^2	$+3x$
$+3$	$+3x$	$+9$

$$f(x) = -4[(x+3)^2 - 9 - 10.25]$$

$$= -4[(x+3)^2 - 19.25]$$

$$= -4(x+3)^2 + 79$$

Vertex: $(-3, 79)$

roots:

$a = 4,\ b = 24,\ c = -41$

$$x = \frac{-24 \pm \sqrt{24^2 - 4(4)(-41)}}{2 \cdot 4}$$

$$\frac{-24 \pm \sqrt{1232}}{8} = \frac{-24 \pm 4\sqrt{77}}{8} = \boxed{\frac{-6 \pm \sqrt{77}}{2}}$$

$\sqrt{1232} = \sqrt{16 \cdot 77} = 4\sqrt{77}$

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Use long division to divide:

7. $3x^3 - 5x^2 + 10x - 3 \div 3x + 1$

8. $7x^3 + 3 \div x + 2$

7.

$$\begin{array}{r} x^2 - 2x + 4 \\ 3x+1 \overline{)\, 3x^3 - 5x^2 + 10x - 3} \\ -3x^3 - x^2 \\ \hline -6x^2 + 10x \\ +6x^2 + 2x \\ \hline 12x - 3 \\ -12x - 4 \\ \hline -7 \end{array}$$

$\boxed{x^2 - 2x + 4 \text{ R } -7}$

-7
Remainder

8.

$$\begin{array}{r} 7x^2 - 14x + 28 \\ x+2 \overline{)\, 7x^3 + 0x^2 + 0x + 3} \\ -7x^3 - 14x^2 \\ \hline -14x^2 + 0x \\ +14x^2 + 28x \\ \hline 28x + 3 \\ -28x - 56 \\ \hline -53 \end{array}$$

$\boxed{7x^2 - 14x + 28 \text{ R } -53}$

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For the problems below:

(a) Find all real roots
(b) Apply the leading coefficient test
(c) sketch the graph for the equation. If necessary find additional points on the graph.

a. $0 = x[x^2 - x - 2]$

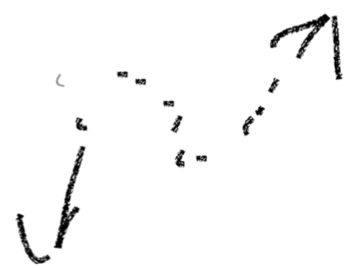
$+1 - 2 = -1$

$0 = x(x+1)(x-2)$

roots: 0, -1, 2

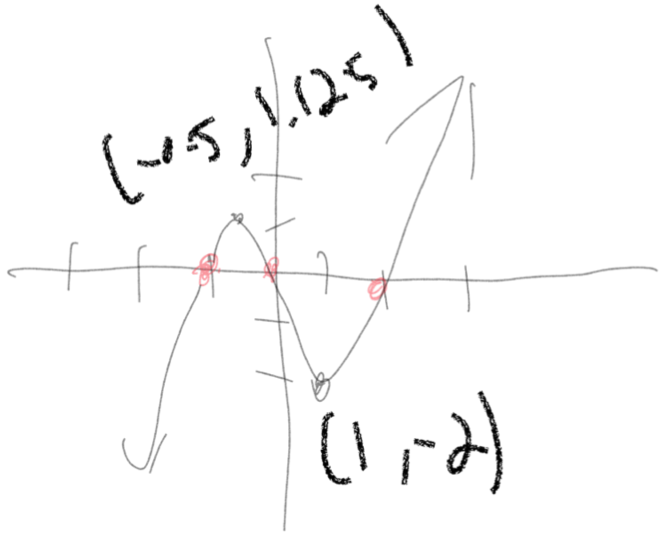
b. leading coefficient: +

highest exp: even



c.

graph:



find additional points

x	-0.5	1
y	1.125	-2

(plug in -0.5, 1 for x)

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9. $f(x) = x^3 - x^2 - 2x$

10. $f(x) = x^3 + 2x^2 - 6x$

10.

0 is a root

a. $0 = x(x^2 + 2x - 6)$

$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(-6)}}{2 \cdot 1} =$$

$$\frac{-2 \pm \sqrt{4 + 24}}{2} \quad 4 + 24 = 28$$

$\boxed{\sqrt{28} = \sqrt{4 \cdot 7} = \sqrt{4}\sqrt{7} = 2\sqrt{7}}$

$$= \frac{-2 \pm 2\sqrt{7}}{2} = -1 \pm \sqrt{7}$$

$\approx -3.65, 1.65$

roots: $-3.65, 0, 1.65$

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Plot addional points
(plug in -3, -1, 1
for x)

X	-3	-1	1
Y	9	7	-3