

1. Use the functions  $f(x) = x^2$  and  $g(x) = \sqrt{2-x}$  to find the specified function:

- a.  $(f - g)(x)$     b.  $\left(\frac{f}{g}\right)(x)$     c.  $(f \circ g)(x)$     d.  $(g \circ f)(x)$

$$a) (f - g)(x) = f(x) - g(x) =$$
$$\boxed{x^2 - \sqrt{2-x}}$$

$$b) \left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \boxed{\frac{x^2}{\sqrt{2-x}}}$$

$$c) (f \circ g)(x) = f(g(x)) = [g(x)]^2 = (\sqrt{2-x})^2$$
$$\boxed{= 2-x}$$

$$d) (g \circ f)(x) = g(f(x)) = \sqrt{2 - f(x)}$$
$$\boxed{= \sqrt{2-x^2}}$$

2. What is the domain for (1b)? Justify your answer.

$$2 - x > 0$$

$$+x \quad +x$$

$2 > x$

3. Identify the vertex and x-intercepts of the graph of  $y = x^2 + 5x + 6$

Vertex:  $x$

$x$	$+2.5$
$x^2$	$+2.5x$
$+2.5$	$+6.25$

 $y = (x^2 + 5x + 6.25) - 1.25 + 6$ 
 $y = (x + 2.5)^2 - 0.25$

Vertex:  $(-2.5, -0.25)$

Factoring:

$$x^2 + 5x + 6 = 0$$

$$\wedge$$

$$3 + 2 = 5$$

$$(x + 2)(x + 3) = 0$$

$$x = -2, -3$$

Quadratic Formula:

$$a = 1$$

$$b = 5$$

$$c = 6$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(6)}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{25 - 24}}{2} = \frac{-5 \pm 1}{2}$$

$$x = -2, -3$$

4. Find all the real zeros for  $f(x) = 4x^3 - 12x^2 + 9x$

$$0 = 4x^3 - 12x^2 + 9x = x[4x^2 - 12x + 9]$$

\*  $x=0$ , factor the quadratic

$$a=4, b=-12, c=9$$

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(4)(9)}}{2 \cdot 4} = \frac{12 \pm \sqrt{144 - 144}}{8}$$

$$= \frac{12}{8} = \frac{3}{2}, \quad x = 0, \frac{3}{2}$$

5. Divide using long division. Include a remainder if necessary:

$$\begin{array}{r} 2x^2 + 4x + 13 \\ x-2 \overline{) 2x^3 + 0x^2 + 5x - 3} \\ \underline{-2x^3 + 4x^2} \phantom{-3} \\ 4x^2 + 5x \phantom{-3} \\ \underline{-4x^2 + 8x} \phantom{-3} \\ 13x - 3 \phantom{-3} \\ \underline{-13x + 26} \\ 23 \end{array} \quad \checkmark \quad \text{remainder}$$

6. Sketch the graph of the following function:  $f(x) = x^3 + 7x^2 + 6x$

a) Leading coefficient test  $\nearrow$

b) roots  $0 = x^3 + 7x^2 + 6x = x[x^2 + 7x + 6]$

$$0 = x(x+1)(x+6)$$

$$x = 0, -1, -6$$

y-int: 0

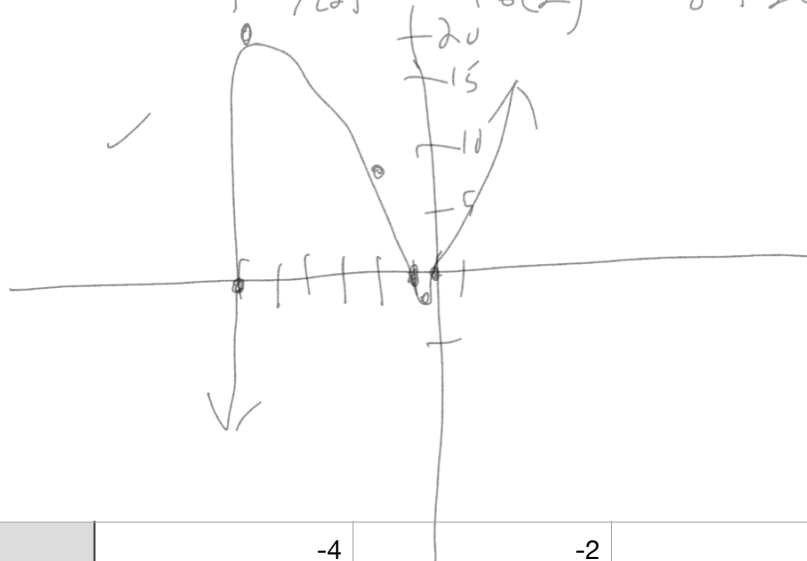
c) Calculate other values

$$f(-4) = (-4)^3 + 7(-4)^2 + 6(-4) = -64 + 112 - 24 = 24$$

$$f(-2) = (-2)^3 + 7(-2)^2 + 6(-2) = -8 + 28 - 12 = 8$$

$$f(2) = 2^3 + 7(2)^2 + 6(2) = 8 + 28 + 12 = 48$$

d) Sketch



<b>x</b>	-4	-2	-0.5
<b>y</b>	24	8	-1.375