

1. Write the function with the given zeros... -5, -6, 1, 1, 1

$$y = a(x+5)(x+6)(x-1)^3$$

2. Write the function with the given zeros and given point. -3, -5, -2 and passes through (-4, 10)

$$y = a(x+3)(x+5)(x+2); (-4, 10) \therefore y = 5(x+3)(x+5)(x+2)$$

$$10 = a(-1)(1)(-2) \quad \underline{\underline{a=5}}$$

3. Determine the equation of a quartic function with zeros 3, 3, -1, and -4; and its graph has a y-intercept of -6.

$$y = a(x-3)^2(x+1)(x+4); (0, -6) \quad y = \frac{-1}{6}(x-3)^2(x+1)(x+4)$$

$$-6 = a(9)(1)(4) \quad \underline{\underline{a = -\frac{1}{6}}}$$

4. Determine the value(s) of k in the equations, so that one root is triple the other root.

a)  $x^2 - 8x + k = 0$

$$(x-r)(x-3r) = 0 \quad k = 3r^2$$

$$x^2 - 4rx + 3r^2 = 0 \quad \therefore k = 3(2)^2$$

$$-4r = -8 \quad \underline{\underline{k=12}}$$

$$\underline{\underline{r=2}}$$

b)  $3x^2 + 4kx + 18 = 0$

$$3x^2 - 12rx + 9r^2 = 0$$

$$9r^2 = 18 \quad -12r = 4k$$

$$r^2 = 2 \quad -3r = k$$

$$\underline{\underline{r = \pm\sqrt{2}}} \quad \therefore \underline{\underline{k = \pm 3\sqrt{2}}}$$

5. Solve  $3x^4 + 2x^3 = 4x^2 + 2$  using a graphing calculator. Answer(s) to two decimal places.

Zeros (roots) @ -1.63 & 1.08

6. Answer the following for each rational function.

<p>a) <math>y = \frac{x^2 - 3x + 2}{x^2 - 1}</math></p> $y = \frac{(x-2)(x-1)}{(x+1)(x-1)}$	<p>Restriction(s) <u><math>x \neq -1, 1</math></u></p> <p>Vert. Asymptote(s) <u><math>x = -1</math></u></p> <p>Hole <u><math>(1, -\frac{1}{2})</math></u></p> <p>Domain <u><math>x \neq -1 \text{ or } 1</math></u></p>	<p>Horizontal Asymptote <u><math>y = 1</math></u></p> <p>Slant Asymptote (yes or No) <u>no</u></p> <p>Range <u><math>y \neq 1, -\frac{1}{2}</math></u></p>
<p>b) <math>y = \frac{x^2 + 4}{x - 2}</math></p>	<p>Restriction(s) <u><math>x \neq 2</math></u></p> <p>Vert. Asymptote(s) <u><math>x = 2</math></u></p> <p>Hole <u>none</u></p> <p>Domain <u><math>x \neq 2</math></u></p>	<p>Horizontal Asymptote <u>none</u></p> <p>Slant Asymptote (<input checked="" type="radio"/> yes or <input type="radio"/> No)</p> <p>Range <u><math>y \leq -1.66</math> and <math>y \geq 9.66</math></u></p>
<p>c) <math>y = \frac{3x^2}{x^2 + 2x - 15}</math></p> $y = \frac{3x^2}{(x+5)(x-3)}$	<p>Restriction(s) <u><math>x \neq -5, 3</math></u></p> <p>Vert. Asymptote(s) <u><math>x = -5, 3</math></u></p> <p>Hole <u>none</u></p> <p>Domain <u><math>x \neq -5, 3</math></u></p>	<p>Horizontal Asymptote <u><math>y = 3</math></u></p> <p>Slant Asymptote (yes or No) <u>no</u></p> <p>Range <u><math>y &gt; 3</math> and <math>y \leq 0</math></u></p>

7. Solve the following without graphing. (factor and show work)

a)  $x^3 + 5x^2 - 36x = 0$     b)  $x^4 - 11x^2 + 18 = 0$     c)  $12x^2 + 11x = 36$     d)  $2x^3 - 8 = 0$

$x(x^2 + 5x - 36) = 0$      $(x^2 - 9)(x^2 - 2) = 0$      $12x^2 + 11x - 36 = 0$      $x^3 = 4$   
 $x(x+9)(x-4) = 0$      $x = \pm 3, \pm \sqrt{2}$      $(4x+9)(3x-4) = 0$      $x = \sqrt[3]{4}$   
 $x = 0, -9, 4$      $x = -\frac{9}{4}, \frac{4}{3}$

8. Given the following functions  $f(x) = 5 - 2x$  and  $g(x) = x^2 + 2$  find...

a)  $f(3) =$     b)  $g(-2) =$     c)  $f(g(0)) =$     d)  $f(g(x)) =$

$f(3) = 5 - 2(3)$      $g(-2) = (-2)^2 + 2$      $f(2) = 5 - 2(2)$      $f(g(x)) = 5 - 2(x^2 + 2)$   
 $f(3) = -1$      $g(-2) = 6$      $f(2) = 1$      $f(g(x)) = 1 - 2x^2$

9. Find any relative/absolute maximum and minimums for the following function.

$f(x) = -0.8x^4 + x^3 + 3x^2 + 1$

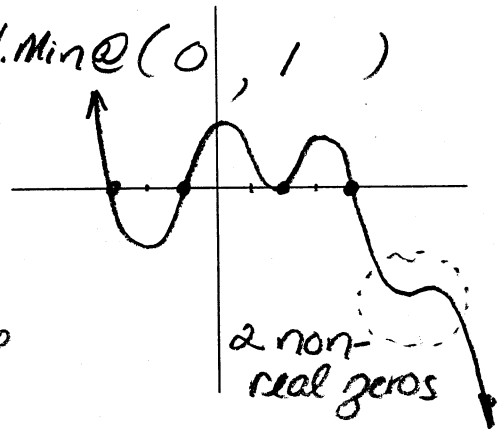
Absolute Max @ (1.92, 8.27)

Relative Max @ (-0.98, 2.20)

Rel. Min @ (0, 1)

10. A polynomial has a triple zero at 4, a double zero at 2, a single zero at -1, -3 and two not real zeros. If the y-intercept is positive, sketch the graph over there →

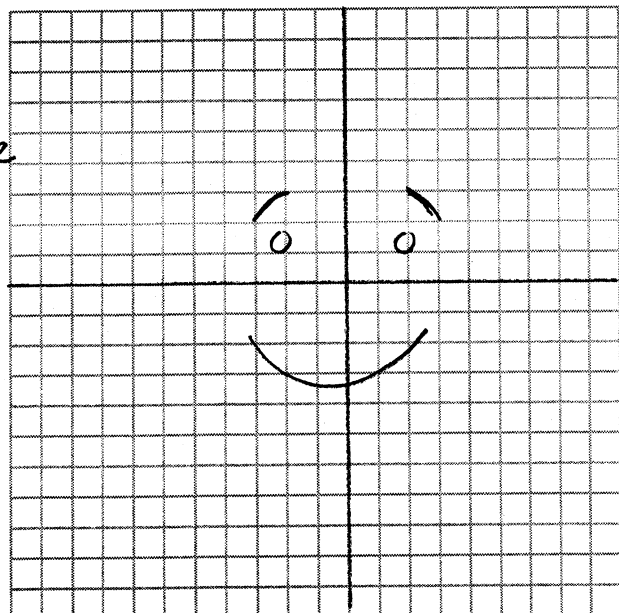
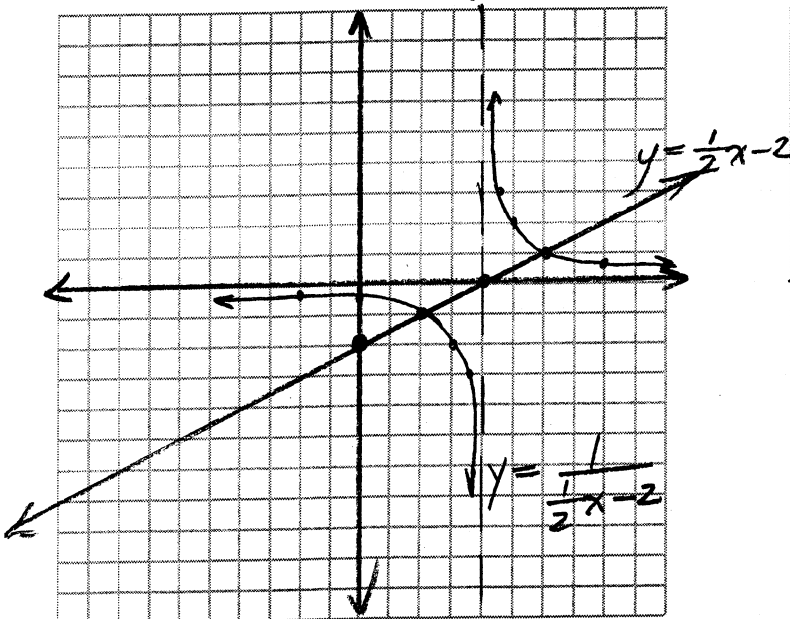
- 9th degree
- Has to have a negative leading coefficient



11. Graph the following:

$y = \frac{1}{\frac{1}{2}x - 2} \rightarrow y = \frac{2}{x - 4}$

12. Graph the reciprocal of the following graph:



c)  $y = \frac{5x^3 - 20x}{x^3 + 10x^2 - 24x}$  Vertical asymptote (eqn)  $x = -12$  Horizontal asymptote (eqn)  $y = 5$

$y = \frac{5x(x+2)(x-2)}{x(x+12)(x-2)}$  Hole? (where?)  $x = 2$  ( $2, \frac{10}{7}$ ) Slant asymptote (Yes or No)  No

Domain  $x \neq 0, 2, -12$  Range:  $y \neq 5, \frac{10}{7}$

Restrictions:  $x \neq 0, 2, -12$

Hole:  $y = \frac{5(10)(4)}{2(14)^2} = \frac{10}{7}$

12) If  $f(x) = 3x - 4$  and  $g(x) = x^2 - 1$ , determine the following.

a)  $f(3) = 3(3) - 4 = 5$

b)  $3g(-2) = 3((-2)^2 - 1) = 3(3) = 9$

c) If  $g(x)$  equals 17, solve for 'x'.  $x^2 - 1 = 17 \rightarrow x^2 = 18 \rightarrow x = \pm 3\sqrt{2}$

d)  $f(g(x)) = 3(x^2 - 1) - 4 = 3x^2 - 3 - 4 = 3x^2 - 7$

e)  $g(f(x)) = (3x - 4)^2 - 1 = 9x^2 - 24x + 16 - 1 = 9x^2 - 24x + 15$

13) Determine the equation a polynomial has roots  $\frac{2}{3}$  and  $\frac{3}{4}$ .

$$\begin{aligned} (x - \frac{2}{3})(x - \frac{3}{4}) &= 0 \\ (3x - 2)(4x - 3) &= 0 \\ \underline{12x^2 - 17x + 6} &= 0 \end{aligned}$$