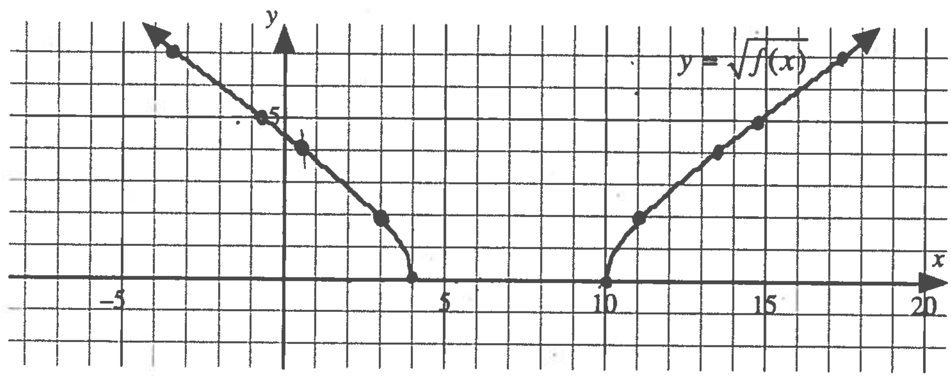
Assignment

Use the following information to answer Question #1.

The function $f(x)$ is a quadratic function with integral zeros.
The graph of $y = \sqrt{f(x)}$ is shown.



1. a) State the x-intercepts of the graph of the radical function $y = \sqrt{f(x)}$. 4, 10

b) State the zeros of the quadratic function $f(x)$. 4, 10

c) Estimate, to the nearest tenth, the roots of the following equations.

$y=4$ $\quad\sqrt{f(x)} = 7 \quad \sqrt{f(x)} = -1$

i) $\sqrt{f(x)} = 4$ 0.6, 13.4 **ii)** $\sqrt{f(x)} - 7 = 0$ -3, 3, 17.3 **iii)** $1 + \sqrt{f(x)} = 0$ no solution. **iv)** $\sqrt{f(x-2)} = 0$ $\sqrt{f(x)} = 0 \rightarrow 4, 10$ so 2 U R $= 6, 12$.

v) $\sqrt{f(x+4)} - 2 = 0$ $\sqrt{f(x)} = 2 \quad 3 + 11$ 4 U L $\sqrt{f(x+4)} = -1 + 7$

vi) $f(x+5) - 25 = 0$ $f(x+5) = 25$ $\sqrt{f(x+5)} = 5$ 5 U L $-0.7 - 5 = -5.7$ $14.7 - 5 = 9.7$

d) The quadratic function, $f(x)$, can be expressed in the factored form $f(x) = a(x - b)(x - c)$.
If the graph of $y = \sqrt{f(x)}$ passes through the point (16, 6), express $f(x)$ in factored fo

$y = f(x)$ passes through (16, 36)

from b) zeros of $f(x)$ are 4 + 10

$f(x) = a(x-4)(x-10)$
$36 = a(16-4)(16-10)$
$36 = 72a \quad a = \frac{1}{2}$

$f(x) = \frac{1}{2}(x-4)(x-10)$

e) Determine the range of $f(x)$.

zeros are at 4, 10
min value at $x = 7$

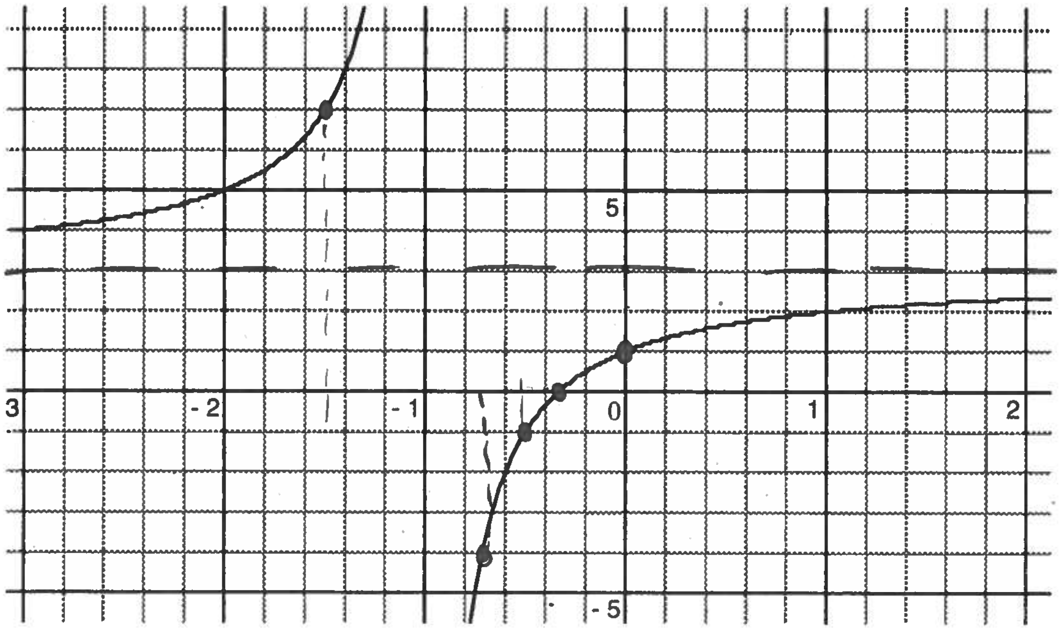
$f(7) = \frac{1}{2}(7-4)(7-10)$
$= -\frac{9}{2}$ (or graphically)

range $y \mid y \geq -9/2, y \in R$.

f) Determine the exact value of the y-intercept of the graph of $y = \sqrt{f(x)}$.

y-int of $\sqrt{1/2(x-4)(x-10)} = \sqrt{1/2(0-4)(0-10)} = \sqrt{20} = \underline{\underline{2\sqrt{5}}}$
(let $x = 0$)

2. The partial graph of the rational function $y = g(x)$ is shown. The non-permissible value is an integer, and the horizontal asymptote has equation $y = 3$.



$y=3$

a) State the equation of the horizontal asymptote of the graph of

i) $y = g(x) + 2$ **ii)** $y = g(x + 2)$ **iii)** $y = g(x + a) - d$

$2\uparrow = 2+3 = 5$ ($y=5$) $y=3$ $y = 3 - d$

b) State the equation of the vertical asymptote of the graph of

i) $y = g(x) + 2$ **ii)** $y = g(x + 2)$ **iii)** $y = g(x + a) - d$

$x = -1$ $x = -3$ $x = -1 - a$

c) Estimate, to the nearest tenth, the roots of the following equations.

i) $g(x) = 1$ ($y=1$) **ii)** $g(x) + 1 = 0$ **iii)** $g(x + 1) = 0$ **iv)** $g(x - 5) - 7 = 0$

0 $g(x) = -1$ $-0.3 - 1 = -1.3$ $g(x-5) = 7$

-0.5 $-1.5 + 5 = 3.5$

v) $g(x) = 3$ **vi)** $g(x + 7) = 3$. **vii)** $g(x) + 7 = 3$

no root (asymptote) no root (translates 4, $g(x) = -4$

-0.7

d) The rational function g can be expressed in the form $g(x) = \dfrac{ax + b}{x + c}$. ← nonpermissible value.

If $g(1)$ has an integral value, determine the values of a, b, and c.

non permissible value $x = -1$ → $-1 + c = 0$

$c = 1$

horizontal asymptote $y = 3$

$g(x) = \dfrac{ax+b}{x+1}$

horizontal asymptote $= 3$ so $\dfrac{a}{1} = 3$

so $a = 3$

→ $\dfrac{3x+b}{x+1}$

for b pick point on graph $(2,1)$

$2 = \dfrac{3(1)+b}{1+1}$

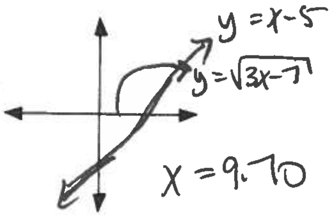
$4 = 3 + b$

$1 = b$

$\boxed{a=3,\ b=1,\ c=1}$

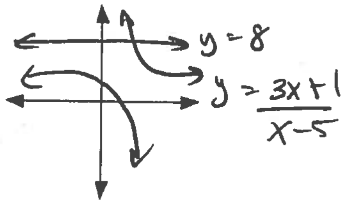
3. Solve the following radical equations graphically. Answer to the nearest hundredth where necessary. Sketch and label the displayed graphs on the grid. → graph + use pt of intersection as solution

a) $y_1 = \sqrt{3x-7}$ $= x - 5$ $y_2 =$



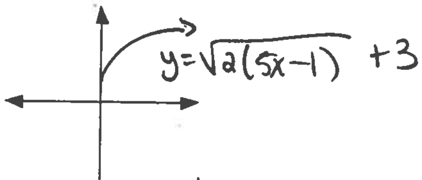
X = 9.70 .

b) $\dfrac{3x+1}{x-5} = 8$



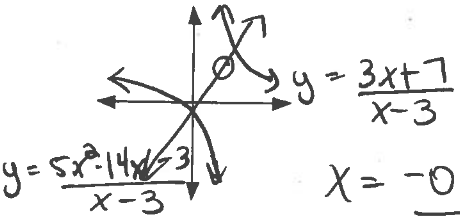
$X = 8.2$

c) $\sqrt{2(5x-1)} + 3 = 0$



no solution .

d) $\dfrac{5x^2 - 14x - 3}{x - 3} = \dfrac{3x + 7}{x - 3}$



$X = -0.51, 3.91$

4. Consider the functions $f(x) = x^2 - x - 30$ and $g(x) = x - 6$.
Determine, graphically, the solutions of the following equations to the nearest tenth.

a) $\left(\dfrac{g}{f}\right)(x) - 3 = 0$

$\dfrac{x-6}{x^2-x-30} - 3 = 0$

$X = -4.7$

b) $\left(\dfrac{f}{g}\right)(x) - 3 = 0$

$\dfrac{x^2-x-30}{x-6} - 3 = 0$

$X = -2.0$

c) $\left(\dfrac{f}{g}\right)(x) - 11 = 0$

$\dfrac{x^2-x-30}{x-6} - 11 = 0$

no solution .

d) $\sqrt{f(x)} = (g \circ f)(x)$

$\sqrt{x^2-x-30} = g(x^2-x-30)$

$\sqrt{x^2-x-30} = x^2 - x - 30 - 6$

$\sqrt{x^2-x-30} = x^2 - x - 36$

$X = -5.8, 6.8$

5. The radius, r, of a baseball is related to the surface area, A, by the formula $r = \dfrac{1}{2}\sqrt{\dfrac{A}{\pi}}$.

a) If the radius of a baseball used in Major League Baseball is 1.45 inches, determine the equation of a radical function which can be graphed so that the x-intercept of the graph would determine the surface area of the baseball.

$1.45 = \frac{1}{2}\sqrt{\frac{A}{\pi}}$

$\frac{1}{2}\sqrt{\frac{A}{\pi}} - 1.45 = 0$

The x-int of $f(x) = \frac{1}{2}\sqrt{\frac{x}{\pi}} - 1.45$ will determine the surface area .

b) Determine, graphically, the surface area of the baseball to the nearest square inch.

$X_{int} = 26.4$ → Surface Area = $26 in^2$

6. A"seconds pendulum" is defined as a pendulum which takes one second to swing from left to right. It has a period of two seconds (http://en.wikipedia.org/wiki/Seconds_pendulum). Use the information in Class Ex. #1 to determine the length of a "seconds pendulum".

$2 = 0.2\sqrt{L}$ → $10 = \sqrt{L}$ → the pendulum is 100cm or 1 m long

$\frac{2}{0.2} = \sqrt{L}$ → $L = 100$

Multiple Choice

7. Consider the function $f(x) = \log(x^2)$.
The complete solution to the equation $2\sqrt{f(x)} - 1 = 0$ is

A. 1.33 **B.** ± 1.33
C. 3.16 **D.** ± 3.16

$2\sqrt{\log(x^2)} - 1 = 0$

8. A student was asked to determine the root(s) of the radical equation $\sqrt{f(x+p)} = q$, where $p, q > 0$, using the graph of the function $y = \sqrt{f(x)}$.

In order to determine the roots of the radical equation $\sqrt{f(x+p)} = q$, the student could

A. determine the x-coordinate(s) of the point(s) where $\sqrt{f(x)} = q$ on the graph of $y = \sqrt{f(x)}$, then add p units to the x-coordinate(s)
B. determine the x-coordinate(s) of the point(s) where $\sqrt{f(x)} = q$ on the graph of $y = \sqrt{f(x)}$, then subtract p units from the x-coordinate(s)
C. determine the x-coordinate(s) of the point(s) where $\sqrt{f(x)} = p$ on the graph of $y = \sqrt{f(x)}$, then add q units to the x-coordinate(s)
D. determine the x-coordinate(s) of the point(s) where $\sqrt{f(x)} = p$ on the graph of $y = \sqrt{f(x)}$, then subtract q units from the x-coordinate(s)

Numerical Response

9. Consider the rational function $f(x) = \dfrac{2x^3 - 15x^2 + 36x - 27}{x - 3}$.
To the nearest tenth, the largest solution of the radical equation $\sqrt{f(x)} = 0$ is _____ .

(Record your answer in the numerical response box from left to right.) | 1 | . | 5 |

zoom 4

$\sqrt{\dfrac{2x^3-15x^2+36x-27}{x-3}} = 0$ nonpermissible value is 3 $x = 1.5$

Answer Key

1. a) 4 and 10 b) 4 and 10
c) Answers may vary slightly i) 0.6 and 13.4 ii) −3.3 and 17.3 iii) no solution iv) 6 and 12 v) −1.1 and 7.1 vi) −5.7 and 9.7
d) $f(x) = 0.5(x-4)(x-10)$ e) $\left\{y \mid y \geq -\frac{9}{2}, y \in R\right\}$ f) $2\sqrt{5}$

2. a) i) $y = 5$ ii) $y = 3$ iii) $y = 3 - d$ b) i) $x = -1$ ii) $x = -3$ iii) $x = -1 - a$
c) i) 0 ii) −0.5 iii) −1.3 iv) 3.5 v) no root vi) no root vii) −0.7
d) $a = 3, b = 1, c = 1$

3. a) 9.70 b) 8.2 c) no solution d) −0.51, 3.91

4. a) −4.7 b) −2.0 c) no solution d) −5.8, 6.8 **5.** a) $f(x) = \frac{1}{2}\sqrt{\frac{x}{\pi}} - 1.45$ b) 26 in^2