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Intermediate Algebra (B) ***Name*** ANSWERS

Tri B Free Response Practice Questions ***Class period*** *1 2 3 4 5*

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1. The height of an object launched vertically is given by $h(t) = -16t^2 + v_0 \cdot t + h_0$ where:

v_0 = initial velocity h_0 = initial height

You launch a model rocket from a 10 foot high platform with an initial velocity 128 ft/sec.

WORK SPACE

$-16(3)^2 + 128(3) + 10 = 250$

$202 = -16t^2 + 128t + 10$
$-202 \qquad -202$
$0 = -16t^2 + 128t - 192$ $a = -16$, $b = 128$, $c = -192$

$t = \dfrac{-(128) \pm \sqrt{4096}}{2(-16)} = \dfrac{-128 \pm 64}{-32}$

$\dfrac{-64}{-32} = 2 \qquad \dfrac{-192}{-32} = 6$

x	y
0	
1	
2	202 ← part c.
3	250 ← part b.
4	
5	
6	202 ← part c.
7	

* max should be at x=4 since the graph is symmetrical

$-16(4)^2 + 128(4) + 10 = 266$

$0 = -16t^2 + 128t + 10$ $a = -16$, $b = 128$, $c = 10$

$t = \dfrac{-128 \pm \sqrt{17024}}{2(-16)}$

$t = \dfrac{-128 \pm 130.476}{-32}$

$\dfrac{2.476}{-32} = -0.077$ ← no negative time

$\dfrac{-258.746}{-32} = 8.077$

a.) Write an equation that models the height of the rocket at time *t*.

$\boxed{h(t) = -16t^2 + 128t + 10}$

b.) Find the height of the rocket after 3 seconds.

$\boxed{\text{250 feet}}$

c.) At what time(s) is the rocket at a height of 202 ft?

$\boxed{\text{2 seconds and 6 seconds}}$

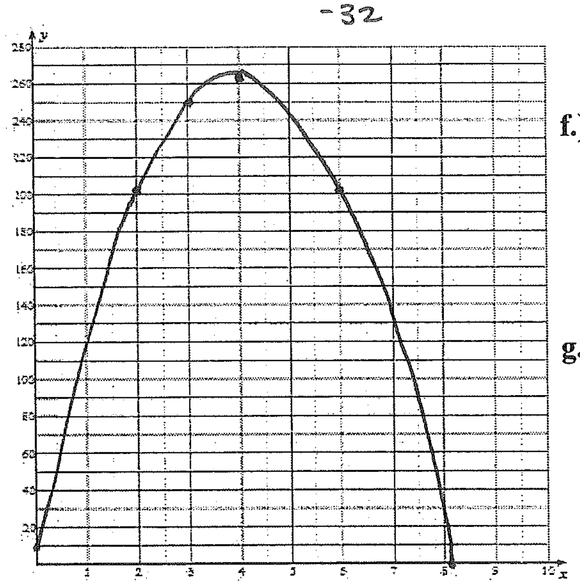
d.) When does the rocket reach the maximum height? What is the maximum height?

$\boxed{\text{4 seconds, 266 feet}}$

e.) When does the rocket land on the <u>ground</u>? → height of 0

$\boxed{\text{8.077 seconds}}$

f.) Using the information you have collected above, sketch a graph depicting the rockets height at time t.



height (feet)

time (seconds)

g.) The equation you wrote above only models the height of the rocket while it is in the air. Find the domain and range of this function.

Domain: $0 \le x \le 8.077$
Range: $0 \le y \le 266$

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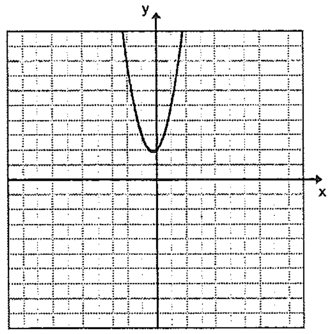
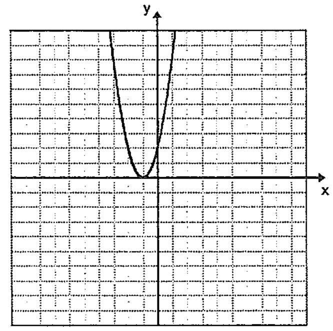
2. For each quadratic equation, find the discriminant. State the number and type of solutions. Using this information, match the quadratic equation to one of the graphs below.

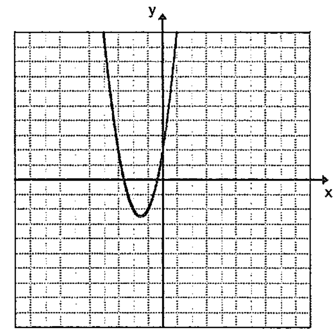
i.)



ii.)



iii.)



WORK SPACE

DISCRIMINANT $= b^2 - 4ac$

$a = 2$
$b = 6$
$c = 2$

$(6)^2 - 4(2)(2) = 20$

h.) $y = 2x^2 + 6x + 2$

Discriminant: 20

Number of Solutions: 2

Type of Solutions: Real or Imaginary
circle one

Graph: i. ii. iii.
circle one

$a = 2$
$b = 4$
$c = 2$

$(4)^2 - 4(2)(2) = 0$

i.) $y = 2x^2 + 4x + 2$

Discriminant: 0

Number of Solutions: 1

Type of Solutions: Real or Imaginary
circle one

Graph: i. ii. iii.
circle one

$a = 2$
$b = 1$
$c = 2$

$(1)^2 - 4(2)(2)$

j.) $y = 2x^2 + 1x + 2$

Discriminant: −15

Number of Solutions: 2 complex → or 0 real

Type of Solutions: Real or Imaginary
circle one

Graph: i. ii. iii.
circle one

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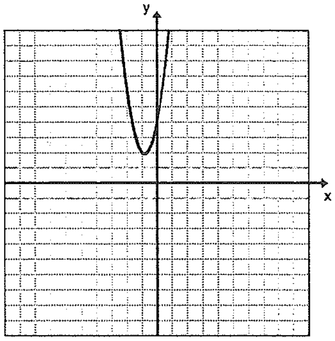
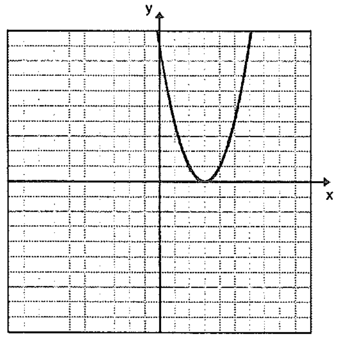
3. A quadratic function is given by $f(x) = ax^2 + bx + c$. Three examples of quadratic functions are shown below.

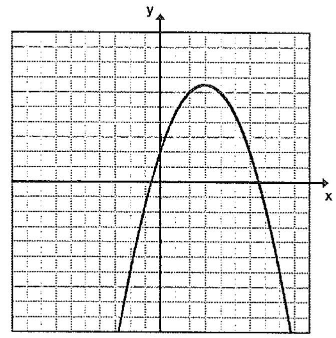
i.)



ii.)



iii.)



a.) In which of the following functions is the constant "a" negative? Explain your reasoning.

iii. because the graph is opening down

If we were to solve the equation $f(x) = 0$ using the quadratic formula, answer the following questions.

WORK SPACE

b.) In which of the following examples would the discriminant be positive? How many solutions would this equation have? What type of numbers are these solutions?

iii. 2 solutions
Real numbers

c.) In which of the following examples would the discriminant be negative? How many solutions would this equation have? What type of numbers are these solutions?

i. 2 complex solutions
or
0 real solutions

d.) In which of the following examples would the discriminant be zero? How many solutions would this equation have? What type of numbers are these solutions?

ii. 1 solution
Real number

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4. Given the function $f(x)=\sqrt{x}+\sqrt{x-3}$

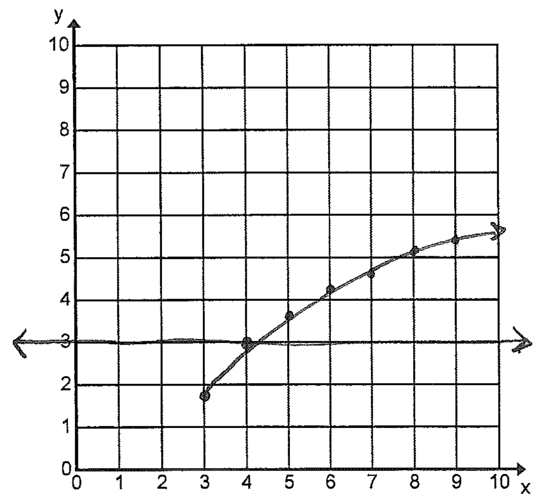
x	$f(x)$
3	1.73
4	3
5	3.6
6	4.2
7	4.6
8	5.1
9	5.4

a.) Identify the domain and range of $f(x)$.

Domain: $x \geq 3$

Range: $y \geq 1.732$

b.) Graph $f(x)$



c.) Solve the equation $f(x) = 3$ (show your work on the graph).

$x = 4$

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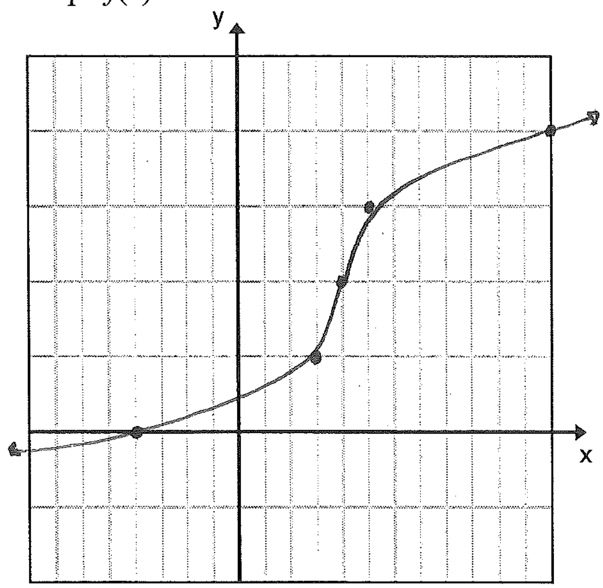
5. Given the function $f(x) = (x-4)^{1/3} + 2$

a.) Identify the domain and range of $f(x)$.

Domain: $\mathbb{R}$

Range: $\mathbb{R}$

b.) Graph $f(x)$



x	$f(x)$
-4	0
3	1
4	2
5	3
12	4

Inflection Point →

c.) Let $g(x) = -(x+5)^{1/3} + 2$.
Solve the equation $f(x) = g(x)$ algebraically.

$$X = -\frac{1}{2}$$

$$(x-4)^{\frac{1}{3}} + 2 = -(x+5)^{\frac{1}{3}} + 2$$
$$-2 \qquad\qquad -2$$
$$\left((x-4)^{\frac{1}{3}}\right)^3 = \left(-(x+5)^{\frac{1}{3}}\right)^3$$
$$x - 4 = -1(x+5)$$
$$x - 4 = -x - 5$$
$$+4 \qquad\quad +4$$
$$x = -x - 1$$
$$+x \qquad +x$$
$$\frac{2x}{2} = \frac{-1}{2}$$
$$x = -\frac{1}{2}$$

Check: $\left(-\frac{1}{2} - 4\right)^{\frac{1}{3}} + 2 = -\left(-\frac{1}{2} + 5\right)^{\frac{1}{3}} + 2$

$0.349 = 0.349$ ✓

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6. A polynomial function is given by $f(x) = 2x^3 + 11x^2 + 17x + d$. A second polynomial function is given by $g(x) = 2x^3 + 3x^2 + cx + 5$. A third polynomial function is given by $h(x) = ax^3 + 4x^2 - 14x + 5$.

WORK SPACE

a.) Given that the one of the factors of f(x) is x+4, find the value of d. Explain your reasoning.

that means the remainder is 0

$$\begin{array}{r|rrrr} -4 & 2 & 11 & 17 & d \\ & \downarrow & -8 & -12 & -20 \\ \hline & 2 & 3 & 5 & 0 \end{array}$$

$d - 20 = 0$
$+20 \quad +20$
$d = 20$

$d = 20$

A factor has to have a remainder of 0.

b.) Given that one of the factors of g(x) is x+1, find the value of c. Explain your reasoning.

$$\begin{array}{r|rrrr} -1 & 2 & 3 & c & 5 \\ & \downarrow & -2 & -1 & \boxed{-5} \\ \hline & 2 & 1 & \boxed{5} & 0 \end{array}$$

$c + -1 = 5$
$+1 \quad +1$
$c = 6$

$c = 6$

A factor has to have a remainder of 0 so working backwards $c + -1 = 5$.

c.) Find the remainder when the polynomial f(x) + g(x) is divided by x+2.

$f(x) + g(x)$

$(2x^3 + 11x^2 + 17x + 20) + (2x^3 + 3x^2 + 6x + 5)$

$4x^3 + 14x^2 + 23x + 25$

$$\begin{array}{r|rrrr} -2 & 4 & 14 & 23 & 25 \\ & \downarrow & -8 & -12 & -22 \\ \hline & 4 & 6 & 11 & 3 \end{array}$$

$\frac{3}{x+2}$

d.) When h(x) is divided by x+3, there is a remainder of 2. Find the value of a. Explain your reasoning.

$a = 3$

See the work shown below.

$$\begin{array}{r|rrrr} -3 & a & 4 & -14 & 5 \\ & & \boxed{-9} & \boxed{15} & \boxed{-3} \\ \hline & \boxed{3} & \boxed{-5} & \boxed{1} & 2 \end{array}$$

start here and work backwards

$5 + \boxed{?} = 2 \qquad ? = -3$
$-3 \cdot \boxed{?} = -3 \qquad ? = 1$
$-14 + \boxed{?} = 1 \qquad ? = 15$
$-3 \cdot \boxed{?} = 15 \qquad ? = -5$
$4 + \boxed{?} = -5 \qquad ? = -9$
$-3 \cdot \boxed{?} = -9 \qquad ? = 3$