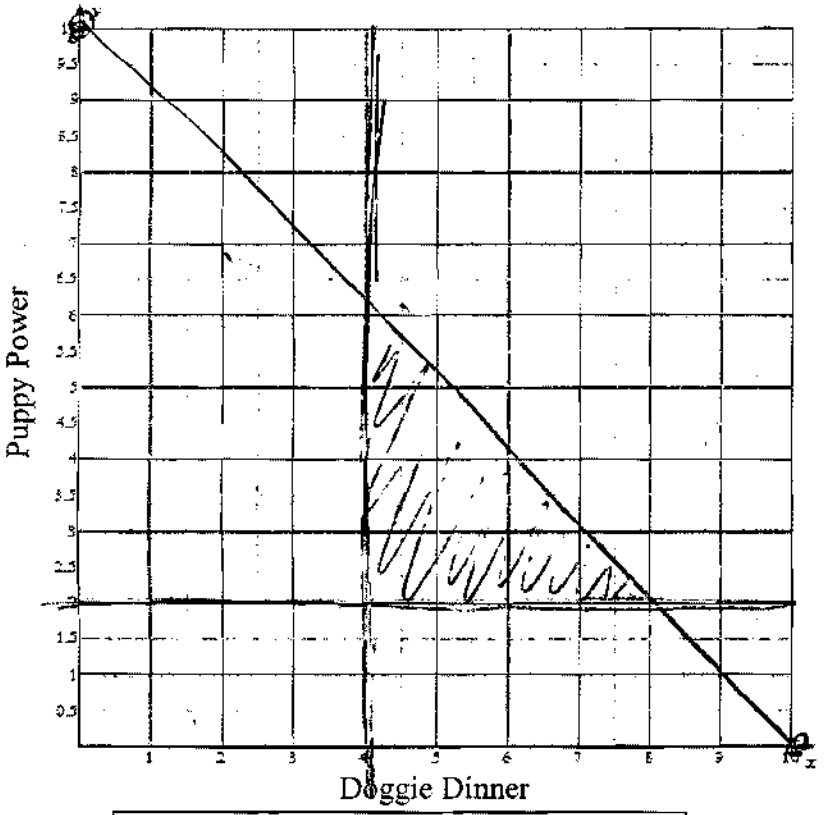
Intermediate Algebra (A) *Name* Key

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

GRAPHING CALCULATOR ***GRAPHING*** CALCULATOR ***GRAPHING*** CALCULATOR

1. One ounce of Doggie Dinner contains 50 grams of carbohydrates. One ounce of Puppy Power contains 90 grams of protein. Susan's vetrenarian puts her dog on a special diet that contains at least 200 grams of carbohydrates and 180 grams of protein per day. Her dog cannot eat more than 10 ounces of food total. Let D stand for the number of ounces of Doggie Dinner and P stand for the number of ounces of Puppy Power. If Doggie Dinner costs 16 cents per ounce and Puppy Power costs 20 cents per ounce, then how many ounces of each would satify the conditions of the special diet and **minimize** the total cost?



WORK SPACE

$C = .16(4) + .20(2) = \$1.04$

$C = .16(4) + .20(6)$ \$1.84

$C = .16(8) + .20(2) = \$1.68$

1.28

a.) Constraints:

$D + P \leq 10$

$50D \geq 200$

$90P \geq 180$

b.) Graph the constraints to answer the following questions.

c.) Objective:

$C = .16D + .20P$

d.) Vertices

(4, 2) (4, 6)

(8, 2)

e.) Minimum Cost

\$1.04

f.) # of ounces Doggie Dinner

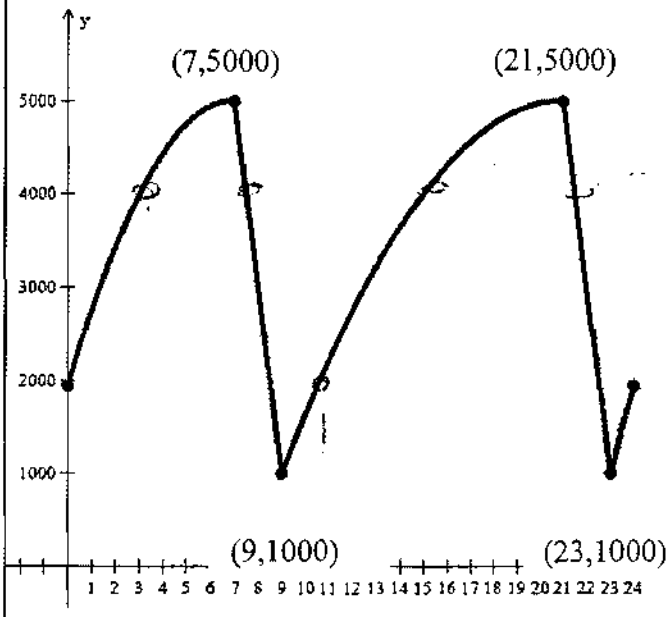
4

g.) # of ounces Puppy Power

2

GRAPHING CALCULATOR GRAPHING CALCULATOR GRAPHING CALCULATOR

2. During the summer, the city of Mosquito Creek institutes water restrictions. Residents are allowed to water before 9 am and/or after 7 pm. Watering between 9 am and 7 pm is not allowed to prevent wasting water because it evaporates immediately. During peak watering hours, the amount of water in the water tower decreases rapidly and during non-watering hours, the water tower refills. x represents the time (in hours) with $x = 0$ representing midnight and $f(x)$ represents the amount of water in the tower (in gallons) at time x. The graph of $y = f(x)$ is shown below. Although the graph of $f(x)$ only depicts the amount of water in the water tower over a 24 hour period, this pattern continues throughout most of the watering season.



WORK SPACE

a.) What is the y-intercept of the graph. Explain the meaning in the context of the problem.

2000
$x = 0$ → midnight
At midnight, there are 2000 gal.

b.) What is the range? Explain the meaning in the context of the problem.

$1000 \leq y \leq 5000$
The amount of water ranges from 1000 to 5000 gallons

What is the average rate of change in the amount of water in the tank (in in gallons per hour) over the time interval from time $x = 9$ hours to $x = 21$ hours.

$$\frac{5000-1000}{21-9} = \frac{4000}{12} \approx 333.\overline{3}$$
gal/hour

d.) Estimate $f(11)$ from the graph. Explain the meaning in the context of the problem.

At 11 AM there are about 2000 gallons in the tower

e.) Find when $f(x) = 4000$. Explain the meaning in the context of the problem.

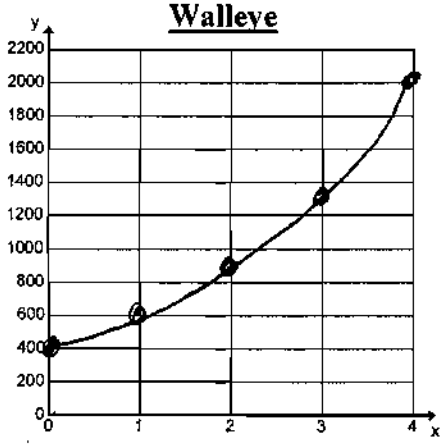
4000 gallons @ 3am, 7am, 3pm and 7pm

GRAPHING CALCULATOR GRAPHING CALCULATOR GRAPHING CALCULATOR

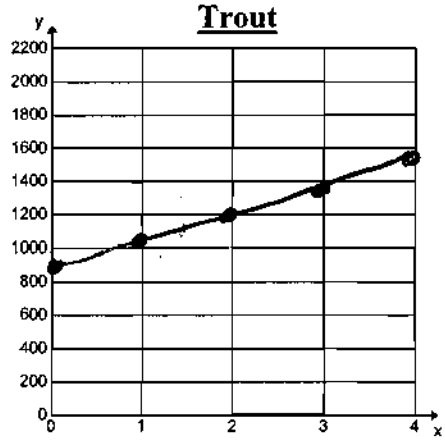
3. A lake contains two types of game fish. Walleye, which naturally reproduce and do not require stocking and trout, which do not naturally reproduce and require stocking to maintain a population. In 2000, there were 400 walleye in the lake and every year since, the number of walleyes in the lake has increased by 50%. In 2000, there were 900 trout in the lake and every year since, the DNR has stocked 150 additional trout.

a.) Complete the graphs and tables below to represent the number of walleyes and the number of trout in the lake in the first 4 years since 2000. Let x represent the number of years since 2000 and let y represent the number of fish in the lake.

Walleye



Trout



x	y
0	400 ← year 2000
1	600
2	900
3	1350
4	2025

+50% ↓

x	y
0	900
1	1050
2	1200
3	1350
4	1500

+150 fish

b.) What type of function would best model each of these situations?

Exponential	Linear

c.) What is the domain and range? Explain your answers in context of the situation.

Domain $x \geq 0$ (Positive years) Range $y \geq 400$	Domain: $x \geq 0$ positive years Range $y \geq 900$

d.) Is there a year that the number of walleye and the number of trout in the lake will be the same?

yes → year 3

e.) In your own words, explain why the number of walleye in the lake eventually surpasses the number of trout even though there were initially substantially more trout?

Exponential Growth is always faster growing.

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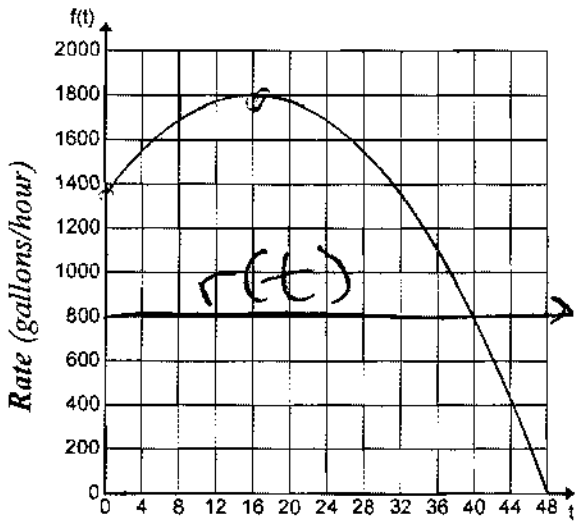
4. An oil platform in the Golf of Mexico has an accident and oil is flowing into the water. The rate at which oil is flowing into the water (in gallons per hour) for the first 48 hours following the accident is given by function $f(t)$. The graph of $f(t)$ is shown below.



TIME (in hours)

a.) Estimate the y-intercept of $f(t)$. Explain the meaning in the context of the problem.

1350 gal/hr is the initial rate of flow

b.) Find the x-intercept of $f(t)$. Explain the meaning in the context of the problem.

(48,0) → after 48 hours the oil has stopped

c.) At what time t is oil flowing into the water at the greatest rate? What rate is oil entering the water at this time?

At 16 hrs, the oil is flowing at 1800 gal/hr.

Two hours after the spill began; an oil skimmer arrived on site and begins removing oil from the water at the constant rate of 800 gallons/hour. Let $r(t)$ represent the rate at which the oil skimmer removes oil from the water.

WORK SPACE

d.) Sketch $r(t)$ on the graph above.

e.) Is there a time when the oil skimmer is removing oil from the water at the exact same rate at which it is entering the water? If so, what time does this occur?

At 40 hours.

f.) During what time period is the total amount of oil in the water decreasing? Explain your reasoning.

After hour 16