Name: _____ *Key* _____ Class Period: _____

Math 2: Unit 4B Review Sheet

Part 1: Writing Variation Equations.

1. If a varies directly as b, and a=24 when b=72, find the equation of variation.

$a = kb$ | $a = \frac{1}{3}b$

$\frac{24}{72} = \frac{k(72)}{72}$

$k = \frac{1}{3}$

$\boxed{a = \frac{1}{3}b}$

2. If the velocity of an object, v, varies inversely with the time it takes to travel the distance, t. The object takes 75 minutes to travel 15 miph. Find the equation of variation.

$v = \frac{k}{t}$ | $v = \frac{1125}{t}$

$75 \cdot 15 = \frac{k}{75} \cdot 75$

$k = 1125$

$\boxed{v = \frac{1125}{t}}$

3. The number of minutes needed to solve an exercise set of variation problems varies directly as the number of problems and inversely as the number of people working on the solutions. It takes 4 people 36 minutes to solve 18 problems. Determine the equation of variation.

m: #minutes
p: #problems
w: #people working

$m = \frac{kp}{w}$ | $m = \frac{8p}{w}$

$4 \cdot 36 = \frac{k(18)}{4} \cdot 4$

$\frac{144}{18} = \frac{k(18)}{18}$

$k = 8$

$\boxed{m = \frac{8p}{w}}$

Part 2: Variation

4. Y varies directly as x. When $y = 9, x = 15$. What does x equal when $y = 45$?

$y = kx$ | $y = .6x$

$9 = k(15)$ | $45 = .6x$

$k = .6$ | $\boxed{x = 75}$

5. Y varies inversely as x. When $y = 16, x = 38$. What does y equal when $x = 32$?

$y = \frac{k}{x}$ | $y = \frac{608}{x}$

$16 = \frac{k}{38}$ | $y = \frac{608}{32}$

$608 = k$ | $\boxed{y = 19}$

6. m varies jointly as n and p. If m = 4, when p = 10, and n = 12, then find n when m = 2 and p = 16.

$m = knp$ | $m = \frac{1}{30}np$

$4 = k(12)(10)$ | $2 = \frac{1}{30}n(16)$

$4 = k(120)$ | $2 = n(\frac{8}{15})$

$k = \frac{1}{30}$ | $\boxed{n = 3.75 \text{ OR } \frac{15}{4}}$

7. z varies directly as w and inversely with the cube of r. If z = 3 when w = 4, and r = 1, then find z when w = 2 and r = 3.

$z = \frac{kw}{r^3}$ | $z = \frac{.75w}{r^3}$

$3 = \frac{k(4)}{1^3}$ | $z = \frac{.75(2)}{3^3} = \boxed{\frac{1}{18}}$

$k = \frac{3}{4}$ ← $3 = k(4)$

Part 3: Applications of Variation

8. The time it takes for a train to travel varies inversely with the speed the train is traveling. If a train travels between two cities in 3 hours at an average speed of 65 miles per hour, how long would it take at an average speed of 75 miles per hour?

t: time (hrs)
v: speed (mph)

$$t = \frac{k}{v}$$
$$3 = \frac{k}{65}$$
$$k = 195$$

$$t = \frac{195}{v}$$
$$t = \frac{195}{75}$$
$$t = \boxed{2.6 \text{ hrs}}$$

$t = ?$

9. The distance that a spring is stretched by a hanging object varies directly as the mass of the object. If the spring stretches 20cm when the mass is 3kg, what is the distance that the spring stretches when the mass is 9kg?

d: distance (cm)
m: mass (kg)

$$d = km$$
$$80 = k(3)$$
$$k = \frac{80}{3}$$

$$d = \frac{80}{3}m$$
$$d = \frac{80}{3}(9)$$
$$d = \boxed{240 \text{ cm}}$$

$d = ?$

Part 4: Graphing Inverse Variation (Reciprocal Functions)

10. $y = \frac{2}{x-4} + 7$

V.A.

H.A.

Parent Function: $y = \frac{2}{x}$

Transformations:

right 4, up 7

Vertical Asymptote (V.A.) $x = 4$

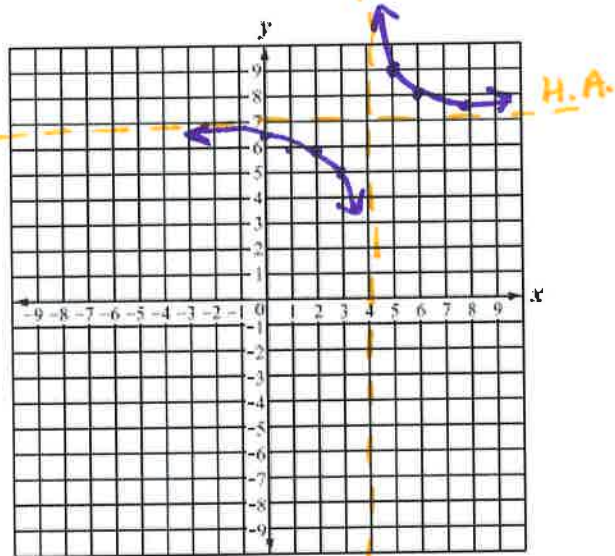Horizontal Asymptote (H.A.) $y = 7$
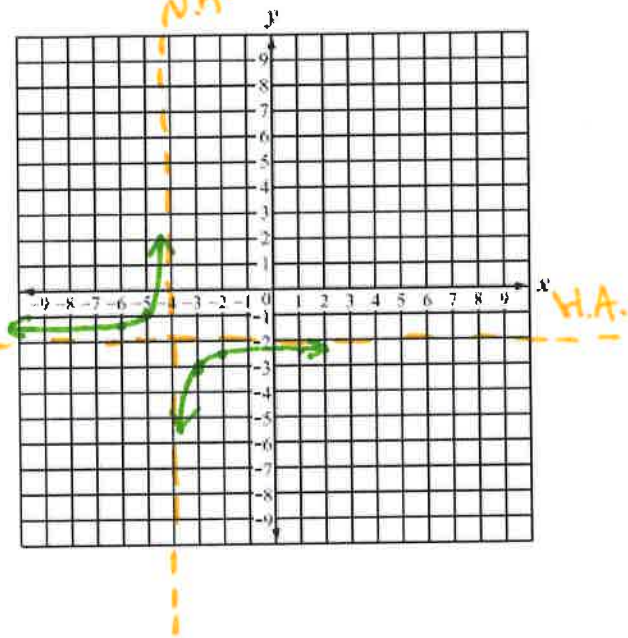
Domain: $x < 4$ and $x > 4$

Range: $y < 7$ and $y > 7$

Increasing Interval: never

Decreasing Interval: $(-\infty, 4) \cup (4, \infty)$

End Behavior: As $x \to -\infty, y \to 7$. As $x \to \infty, y \to 7$.

11. $y = -\dfrac{1}{x+4} - 2$

N.A.

H.A.

Parent Function: $y = \dfrac{1}{x}$

Transformations:

reflect over x-axis, left 4, down 2

Vertical Asymptote (V.A.) $x = -4$

Horizontal Asymptote (H.A.) $y = -2$
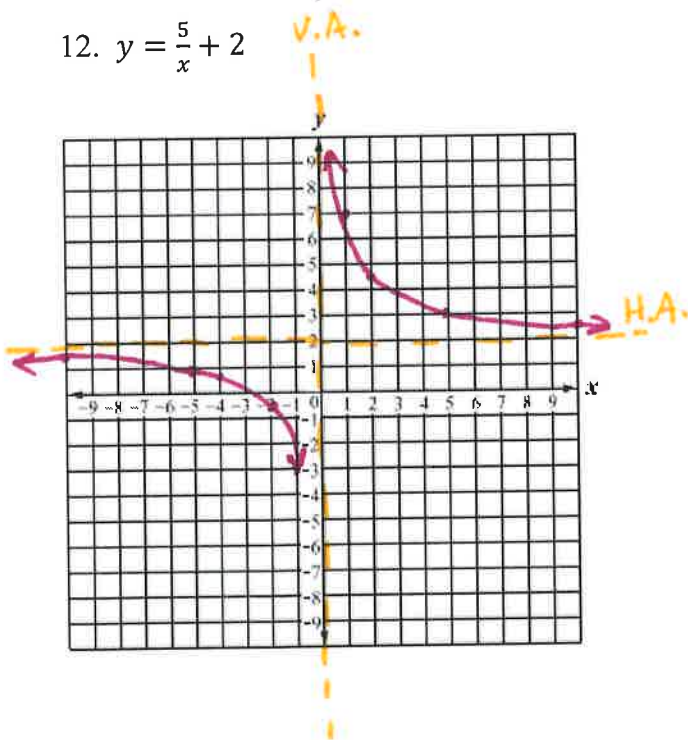
Domain: $x < -4$ and $x > -4$

Range: $y < -2$ and $y > -2$

Increasing Interval: $(-\infty, -4) \cup (-4, \infty)$

Decreasing Interval: never

End Behavior: As $x \to -\infty, y \to -2$. As $x \to \infty, y \to -2$.

12. $y = \dfrac{5}{x} + 2$

V.A.

H.A.

Parent Function: $y = \dfrac{5}{x}$

Transformations:

up 2

Vertical Asymptote (V.A.) $x = 0$

Horizontal Asymptote (H.A.) $y = 2$

Domain: $x < 0$ and $x > 0$

Range: $y < 2$ and $y > 2$

Increasing Interval: never

Decreasing Interval: $(-\infty, 0) \cup (0, \infty)$

End Behavior: As $x \to -\infty, y \to 2$. As $x \to \infty, y \to 2$.