

# Non-Linear Equations: Final Exam Prep

Math II

Name: Key

**Directions:** The following questions are sample items similar to those found on the EOC Exam. Answer each to the best of your ability.

1. A company manufactures DVDs.

- The company spent \$247,000 to develop its process for manufacturing the DVDs.
- The company spends an additional \$1.25 to manufacture each DVD.

Which function represents the average total cost per DVD,  $y$ , for the company to manufacture  $x$  total DVDs?

A  $y = \frac{x}{1.25x}$

B  $y = \frac{1.25x}{x}$

C  $y = \frac{x}{1.25x + 247,000}$

D  $y = \frac{1.25x + 247,000}{x}$

$x = \# \text{ of DVDs}$

$y = \text{Total cost per DVD}$

$$y = \frac{\text{Expenses (cost)}}{\# \text{ of DVDs}} = \frac{1.25x + 247000}{x}$$

2. The volume,  $V$ , of a certain gas varies inversely with the amount of pressure,  $P$ , placed on it. The volume of this gas is  $175 \text{ cm}^3$  when  $3.2 \text{ kg/cm}^2$  of pressure is placed on it. What amount of pressure must be placed on  $400 \text{ cm}^3$  of this gas?

A  $1.31 \text{ kg/cm}^2$

B  $1.40 \text{ kg/cm}^2$

C  $2.86 \text{ kg/cm}^2$

D  $7.31 \text{ kg/cm}^2$

$$V = \frac{k}{P}$$

$$400 = \frac{560}{P}$$

$$175 = \frac{k}{3.2}$$

$$400P = 560$$

$$P = \frac{560}{400} = 1.4$$

$$k = 560$$

3. An investment has a balance of \$2,000 and earns 3.2% interest each year. If \$150 is added at the end of each year by the account holder and no money is withdrawn from the investment, which represents a function that can be used to calculate the investment balance for successive years?

~~A~~  $B_n = 0.032B_{n-1} + 2,000, B_0 = 150$

~~B~~  $B_n = 0.032B_{n-1} + 150, B_0 = 2,000$

C  $B_n = 1.032B_{n-1} + 2,000, B_0 = 150$

D  $B_n = 1.032B_{n-1} + 150, B_0 = 2,000$

$r = 1 + 0.032 = 1.032$  ← more than 1 means growth  
Beginning Amt ( $B_0$ ) = 2000

4. The value,  $V$ , of a car can be modeled by the function  $V(t) = 13,000(0.82)^t$ , where  $t$  is the number of years since the car was purchased. To the nearest tenth of a percent, what is the monthly rate of depreciation?

- A 1.5%  
 B 1.6%  
 C 9.2%  
 (D) 18.0%

$$y = a(1-r)^t$$

↑  
rate of depreciation

$$1-r = 0.82 \quad r = 0.18 = 18\%$$

$$-r = -0.18$$

5. Which expression is equivalent to  $(8w^7x^{-5}y^3z^9)^{\frac{2}{3}}$ ?

(A)  $\frac{x^{\frac{10}{3}}z^6}{4w^{\frac{14}{3}}y^2}$

$$8^{\frac{2}{3}} w^{\frac{-14}{3}} x^{\frac{10}{3}} y^2 z^6$$

B  $\frac{4w^{\frac{14}{3}}y^2}{x^{\frac{10}{3}}z^6}$

$$8^{\frac{2}{3}} w^{\frac{-14}{3}} x^{\frac{10}{3}} y^{-2} z^6$$

C  $\frac{2w^{\frac{5}{3}}y^{\frac{1}{3}}}{x^{\frac{7}{3}}z^{\frac{11}{3}}}$

$$\frac{x^{\frac{10}{3}}z^6}{4w^{\frac{14}{3}}y^2}$$

D  $\frac{x^{\frac{7}{3}}z^{\frac{11}{3}}}{2w^{\frac{5}{3}}y^{\frac{1}{3}}}$

6. Which expression is equivalent to  $\left(\frac{16x^{\frac{1}{6}}y^{-2}}{x^{\frac{1}{6}}y^6}\right)^{\frac{3}{2}}$ ?

A  $24x^{\frac{9}{2}}y^{\frac{9}{2}}$

$$\frac{16^{\frac{3}{2}} x^{\frac{3}{2}} y^{-3}}{x^{\frac{-3}{2}} y^{\frac{18}{2}}} = \frac{64x^{\frac{3}{2}} y^{-3}}{x^{\frac{-3}{2}} y^9} = \frac{64x^{\frac{3}{2} + \frac{3}{2}} y^{-3-9}}{y^9} = \frac{64x^3 y^{-12}}{y^9} = 64x^3 y^{-21}$$

B  $\frac{24x^{\frac{3}{4}}}{y^9}$

C  $\frac{64}{x^{\frac{1}{2}}y^8}$

(D)  $\frac{64x^{\frac{1}{2}}}{y^{12}}$

$$\frac{64x^{\frac{3}{2}}}{y^9}$$

7. A marathon is roughly 26.2 miles long. Which equation could be used to determine the time,  $t$ , it takes to run a marathon as a function of the average speed,  $s$ , of the runner where  $t$  is in hours and  $s$  is in miles per hour?

A  $t = 26.2 - 26.2s$

B  $t = 26.2 - \frac{s}{26.2}$

C  $t = 26.2s$

(D)  $t = \frac{26.2}{s}$

distance = (rate)(time)

$d = st$

$26.2 = st$

$t = \frac{26.2}{s}$

8. The time,  $t$ , in hours, that it takes  $x$  people to plant  $n$  trees varies directly with the number of trees, and inversely with the number of people. Suppose 6 people can plant 12 trees in 3 hours. How many people are needed to plant 28 trees in 5 hours and 15 minutes?

A 6

B 7

(C) 8

D 9

$$\text{time} = \frac{(\# \text{ of trees})K}{\# \text{ of ppl}}$$

$$t = \frac{nk}{x}$$

$$3 = \frac{12k}{6}$$

$$18 = 12k$$

$$k = 1.5$$

15 min = 0.25 hrs

$$5.25 = \frac{28(1.5)}{x}$$

$$x = \frac{28(1.5)}{5.25}$$

$x = 8$

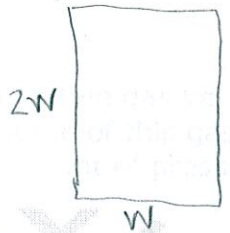
The force,  $F$ , acting on a charged object varies inversely to the square of its distance,  $r$ , from another charged object. When the two objects are 0.64 meter apart, the force acting on them is 8.2 Newtons. **Approximately** how much force would the object feel if it is at a distance of 0.77 meter from the other object?

- A 1.7 Newtons  
 B 5.7 Newtons  
 C 11.9 Newtons  
 D 12.9 Newtons
- $F = \frac{K}{r^2}$   
 $8.2 = \frac{K}{(0.64)^2}$   
 $K = 3.35872$   
 $F = \frac{3.35872}{(0.77)^2}$   
 $F = 5.67$

10. The cost of a newspaper advertisement is a function of its size.

- A company wants its advertisement to have a height that is twice its width.
- The newspaper charges a flat rate of \$50 plus an additional \$10 per square inch.
- The company can spend no more than \$2,050 on the advertisement.

What is the maximum height of an advertisement that the company can afford?

- A 5 inches  
 B 10 inches  
 C 15 inches  
 D 20 inches
- $h = 2w$   
 $\text{Cost} = 10(\text{Area}) + 50$   
 $10(2w^2) + 50 \leq 2050$   
 $20w^2 \leq 2000$   
 $w^2 \leq 100$   
 $w \leq 10$   
 $h \leq 20$
- 

11. The function  $f(x) = \frac{85}{x}$  models the volume of a gas in a balloon under  $x$  units of pressure at a constant temperature. Which **best** describes the domain of  $f(x)$ ?

- A  $0 < x \leq 85$   
 B  $0 \leq x \leq 85$   
 C  $x > 0$   
 D  $x \geq 0$
- $\text{Volume} = \frac{85}{\text{pressure}} \leftarrow \text{can't be zero}$   
 $\frac{85}{85} = 1$

12. Which expression is equivalent to  $(3x^5 + 17x^3 - 1) + (-2x^5 - 6)$ ?

- A  $x^5 + 17x^3 - 7$   
 B  $x^5 - 11x^3 - 1$   
 C  $5x^5 + 17x^3 + 7$   
 D  $-6x^5 + 17x^3 + 6$
- $3x^5 + 17x^3 - 1 - 2x^5 - 6$   
 $1x^5 + 17x^3 - 7$

13. Alberto and Janet start running at the same time in a straight-line path in the same direction.

- Alberto is 1,080 inches behind Janet.  $\frac{1080 \text{ in}}{36 \text{ in}} = 30 \text{ yds}$
- Alberto runs at a constant rate of 1,440 feet per minute.  $\frac{1440 \text{ ft}}{3 \text{ ft}} = \frac{480 \text{ yds}}{60 \text{ sec}} = \frac{8 \text{ yd}}{1 \text{ sec}}$
- Janet runs at a constant rate of 6 yards per second.

After **approximately** how many seconds will Alberto pass Janet?

- (A) 15 seconds  
 B 20 seconds  
 C 25 seconds  
 D 30 seconds

$$\text{Janet} = 6x + 30$$

$$\text{Alberto} = 8x$$

$$8x = 6x + 30$$

$$2x = 30$$

$$x = 15$$

14. The equation  $s = 2\sqrt{5x}$  can be used to estimate the speed,  $s$ , of a car in miles per hour, given the length in feet,  $x$ , of the tire marks it leaves on the ground. A car traveling 90 miles per hour came to a sudden stop. According to the equation, how long would the tire marks be for this car?

- A 355 feet  
 B 380 feet  
 (C) 405 feet  
 D 430 feet

$$s = \text{speed} = 90 \quad s = 2\sqrt{5x}$$

$$x = \text{length of tire marks}$$

$$90 = 2\sqrt{5x}$$

$$45 = \sqrt{5x}$$

$$45^2 = (\sqrt{5x})^2$$

$$2025 = 5x$$

$$x = 405$$

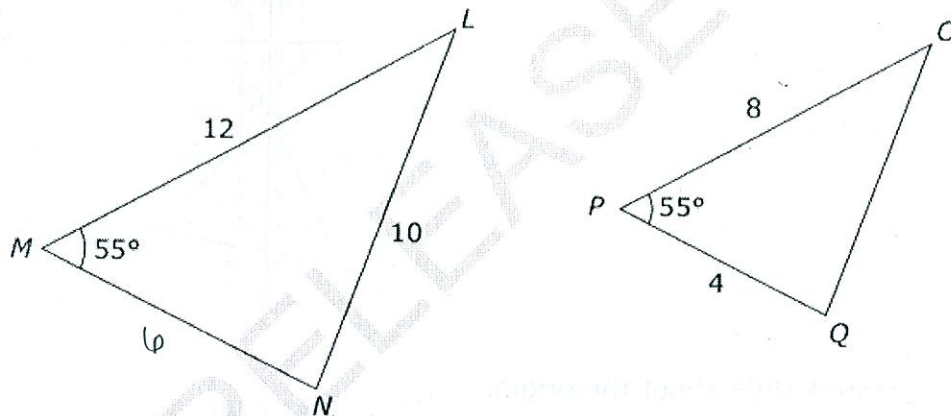
# Transformations: Final Exam Prep

Math II

Name: Key

**Directions:** The following questions are sample items similar to those found on the EOC Exam. Answer each to the best of your ability.

1. Triangles  $LMN$  and  $OPQ$  are shown below.



What additional information is sufficient to show that  $\triangle LMN$  can be transformed and mapped onto  $\triangle OPQ$ ?

- A  $OQ = 6$   
 B  $MN = 9$   
~~C  $\angle LMN \cong \angle QOP$~~   
 D  $\angle NLM \cong \angle QOP$

$$\frac{8}{12} = \frac{4}{x}$$

$$\frac{8}{12} = \frac{6}{10}$$

$$48 = 8x$$

$$x = 6$$

2. Point  $P(-3, -1)$  is transformed using the rule  $(x', y') = (x - 3, y + 1)$ . The image  $P'$  is then rotated clockwise  $90^\circ$  about the origin, resulting in point  $P''$ . What are the coordinates of  $P''$ ?

- A  $(-6, 0)$   
 B  $(0, -6)$   
 C  $(0, 6)$   
 D  $(6, 0)$

$$P' = (-3-3, -1+1) = (-6, 0)$$

$$P''(y, -x) = (0, +6)$$

3.  $\triangle WXY$  has vertices  $W(2, 5)$ ,  $X(6, 2)$ , and  $Y(2, 2)$ . If  $\triangle WXY$  is dilated by a factor of  $\frac{1}{2}$ , what are the coordinates of  $X'$  in the transformed triangle?

- A  $(1, 3)$   
 B  $(3, 1)$   
 C  $(4, 12)$   
 D  $(12, 4)$

$$X' = \left( 6\left(\frac{1}{2}\right), 2\left(\frac{1}{2}\right) \right)$$

$$X' = (3, 1)$$