fall09a2

1 The expression $(3 - 7i)^2$ is equivalent to
1) $-40 + 0i$
2) $-40 - 42i$
3) $58 + 0i$
4) $58 - 42i$

2 If $f(x) = \frac{1}{2}x - 3$ and $g(x) = 2x + 5$, what is the value of $(g \circ f)(4)$?
1) -13
2) 3.5
3) 3
4) 6

3 What are the values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\tan\theta - \sqrt{3} = 0$?
1) $60°, 240°$
2) $72°, 252°$
3) $72°, 108°, 252°, 288°$
4) $60°, 120°, 240°, 300°$

4 A survey completed at a large university asked 2,000 students to estimate the average number of hours they spend studying each week. Every tenth student entering the library was surveyed. The data showed that the mean number of hours that students spend studying was 15.7 per week. Which characteristic of the survey could create a bias in the results?
1) the size of the sample
2) the size of the population
3) the method of analyzing the data
4) the method of choosing the students who were surveyed

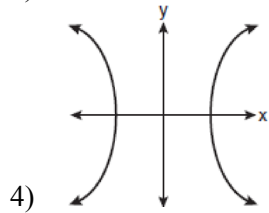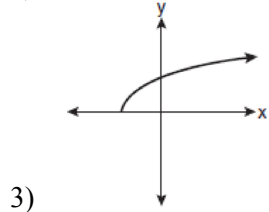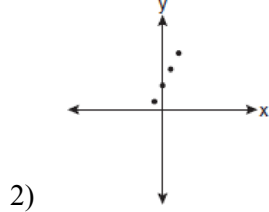5 Which graph represents the solution set of $|6x - 7| \le 5$?

1)

2)

3)

4)
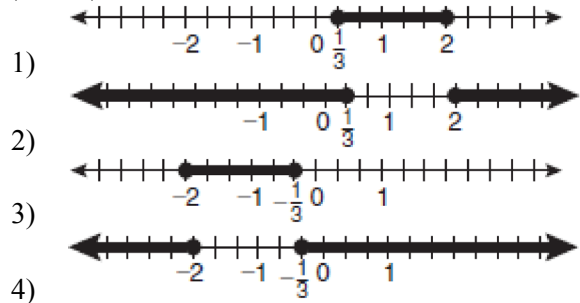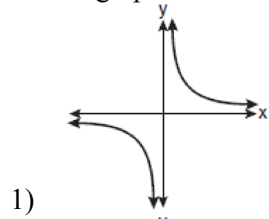

6 Which function is *not* one-to-one?
1) $\{(0,1),(1,2),(2,3),(3,4)\}$
2) $\{(0,0),(1,1),(2,2),(3,3)\}$
3) $\{(0,1),(1,0),(2,3),(3,2)\}$
4) $\{(0,1),(1,0),(2,0),(3,2)\}$

7 In $\triangle ABC$, $m\angle A = 120$, $b = 10$, and $c = 18$. What is the area of $\triangle ABC$ to the *nearest square inch*?
1) 52
2) 78
3) 90
4) 156

8 Which graph does *not* represent a function?

1)

2)

3)

4)

9 The expression $\log_8 64$ is equivalent to
1) 8
2) 2
3) $\dfrac{1}{2}$
4) $\dfrac{1}{8}$

10 The expression $\cos 4x \cos 3x + \sin 4x \sin 3x$ is equivalent to
1) $\sin x$
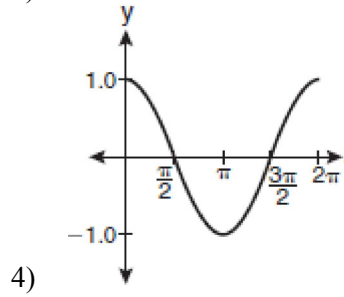2) $\sin 7x$
3) $\cos x$
4) $\cos 7x$
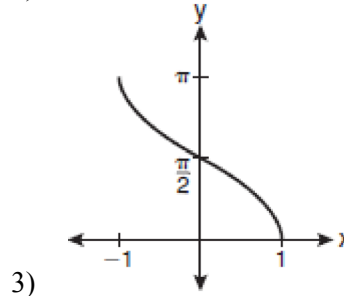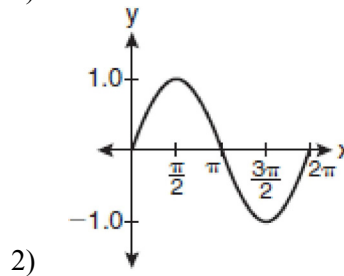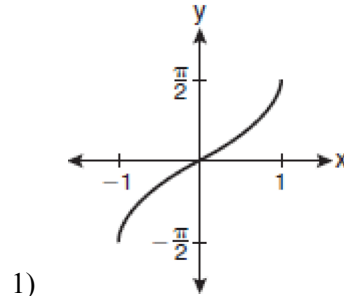
11 The value of the expression $2\sum_{n=0}^{2}(n^2 + 2^n)$ is
1) 12
2) 22
3) 24
4) 26

12 For which equation does the sum of the roots equal $\dfrac{3}{4}$ and the product of the roots equal -2?
1) $4x^2 - 8x + 3 = 0$
2) $4x^2 + 8x + 3 = 0$
3) $4x^2 - 3x - 8 = 0$
4) $4x^2 + 3x - 2 = 0$

13 Which graph represents the equation $y = \cos^{-1}x$?

1)

2)

3)

4)

14 The expression $\dfrac{a^2 b^{-3}}{a^{-4} b^2}$ is equivalent to

1) $\dfrac{a^6}{b^5}$

2) $\dfrac{b^5}{a^6}$

3) $\dfrac{a^2}{b}$

4) $a^{-2} b^{-1}$

15 The lengths of 100 pipes have a normal distribution
with a mean of 102.4 inches and a standard
deviation of 0.2 inch. If one of the pipes measures
exactly 102.1 inches, its length lies
1) below the 16th percentile
2) between the 50th and 84th percentiles
3) between the 16th and 50th percentiles
4) above the 84th percentile

16 If a function is defined by the equation $f(x) = 4^x$,
which graph represents the inverse of this function?
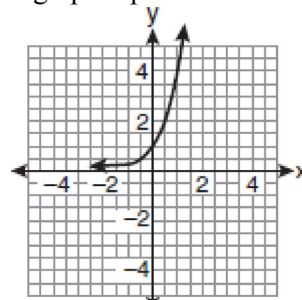
1)
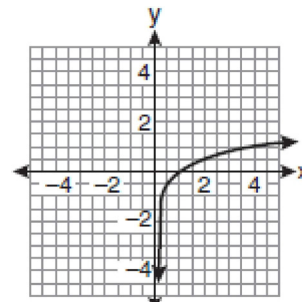
2)
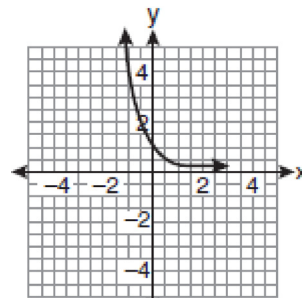
3)
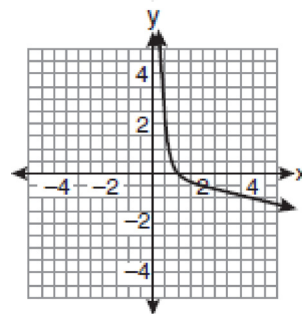
4)

17 Factored completely, the expression $6x - x^3 - x^2$ is
equivalent to
1) $x(x + 3)(x - 2)$
2) $x(x - 3)(x + 2)$
3) $-x(x - 3)(x + 2)$
4) $-x(x + 3)(x - 2)$

18 The expression $4ab\sqrt{2b} - 3a\sqrt{18b^3} + 7ab\sqrt{6b}$ is equivalent to
1) $2ab\sqrt{6b}$
2) $16ab\sqrt{2b}$
3) $-5ab + 7ab\sqrt{6b}$
4) $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

19 What is the fourth term in the expansion of $(3x - 2)^5$?
1) $-720x^2$
2) $-240x$
3) $720x^2$
4) $1,080x^3$

20 Written in simplest form, the expression $\dfrac{\dfrac{x}{4} - \dfrac{1}{x}}{\dfrac{1}{2x} + \dfrac{1}{4}}$ is equivalent to
1) $x - 1$
2) $x - 2$
3) $\dfrac{x - 2}{2}$
4) $\dfrac{x^2 - 4}{x + 2}$

21 What is the solution of the equation $2\log_4(5x) = 3$?
1) 6.4
2) 2.56
3) $\dfrac{9}{5}$
4) $\dfrac{8}{5}$

22 A circle has a radius of 4 inches. In inches, what is the length of the arc intercepted by a central angle of 2 radians?
1) 2π
2) 2
3) 8π
4) 8

23 What is the domain of the function $f(x) = \sqrt{x - 2} + 3$?
1) $(-\infty, \infty)$
2) $(2, \infty)$
3) $[2, \infty)$
4) $[3, \infty)$

24 The table below shows the first-quarter averages for Mr. Harper's statistics class.

Statistics Class Averages

Quarter Averages	Frequency
99	1
97	5
95	4
92	4
90	7
87	2
84	6
81	2
75	1
70	2
65	1

What is the population variance for this set of data?
1) 8.2
2) 8.3
3) 67.3
4) 69.3

25 Which formula can be used to determine the total number of different eight-letter arrangements that can be formed using the letters in the word *DEADLINE*?
1) $8!$
2) $\dfrac{8!}{4!}$
3) $\dfrac{8!}{2! + 2!}$
4) $\dfrac{8!}{2! \cdot 2!}$

26 The graph below shows the function f(x).
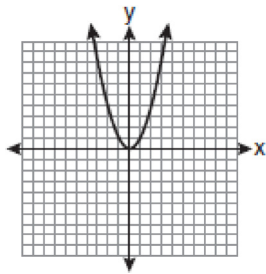
Which graph represents the function f(x + 2)?

1)

2)

3)

4)
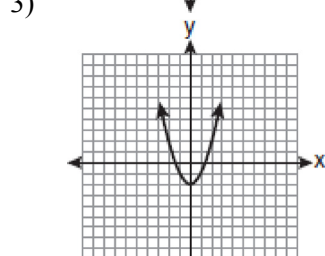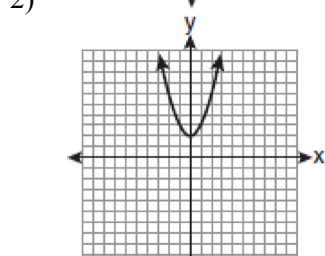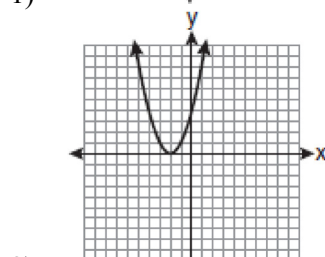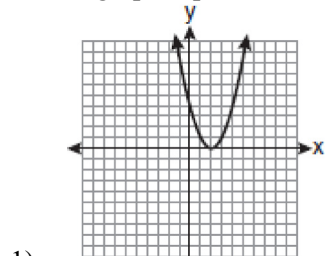
27 The equation $y - 2\sin\theta = 3$ may be rewritten as
1) $f(y) = 2\sin x + 3$
2) $f(y) = 2\sin\theta + 3$
3) $f(x) = 2\sin\theta + 3$
4) $f(\theta) = 2\sin\theta + 3$

28 Express $\dfrac{5}{3 - \sqrt{2}}$ with a rational denominator, in simplest radical form.

29 Write an equation of the circle shown in the graph below.
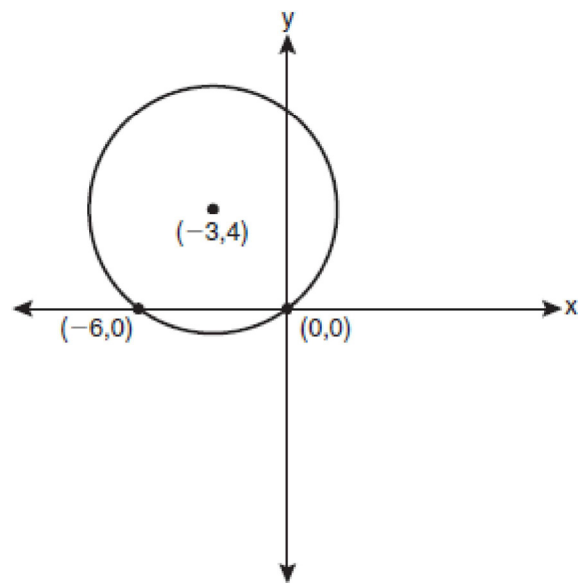
30 Solve for x: $\dfrac{4x}{x - 3} = 2 + \dfrac{12}{x - 3}$

31 Find, to the *nearest minute*, the angle whose measure is 3.45 radians.

32 Matt places $1,200 in an investment account earning an annual rate of 6.5%, compounded continuously. Using the formula $V = Pe^{rt}$, where V is the value of the account in t years, P is the principal initially invested, e is the base of a natural logarithm, and r is the rate of interest, determine the amount of money, to the *nearest cent*, that Matt will have in the account after 10 years.

33 If θ is an angle in standard position and its terminal side passes through the point $(-3,2)$, find the exact value of $\csc \theta$.

34 Find the first four terms of the recursive sequence defined below.
$$a_1 = -3$$
$$a_n = a_{(n-1)} - n$$

35 A committee of 5 members is to be randomly selected from a group of 9 teachers and 20 students. Determine how many different committees can be formed if 2 members must be teachers and 3 members must be students.

36 Solve $2x^2 - 12x + 4 = 0$ by completing the square, expressing the result in simplest radical form.

37 Solve the equation $8x^3 + 4x^2 - 18x - 9 = 0$ algebraically for all values of x.

38 The table below shows the results of an experiment involving the growth of bacteria.

Time (x) (in minutes)	1	3	5	7	9	11
Number of Bacteria (y)	2	25	81	175	310	497

Write a power regression equation for this set of data, rounding all values to *three decimal places*. Using this equation, predict the bacteria's growth, to the *nearest integer*, after 15 minutes.

39 Two forces of 25 newtons and 85 newtons acting on a body form an angle of 55°. Find the magnitude of the resultant force, to the *nearest hundredth of a newton*. Find the measure, to the *nearest degree*, of the angle formed between the resultant and the larger force.

fall09a2
Answer Section

1 ANS: 2
$(3 - 7i)(3 - 7i) = 9 - 21i - 21i + 49i^2 = 9 - 42i - 49 = -40 - 42i$

PTS: 2   REF: fall0901a2   STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

2 ANS: 3
$f(4) = \dfrac{1}{2}(4) - 3 = -1.$ $g(-1) = 2(-1) + 5 = 3$

PTS: 2   REF: fall0902a2   STA: A2.A.42   TOP: Compositions of Functions
KEY: numbers

3 ANS: 1

$\tan \theta - \sqrt{3} = 0$

$\qquad \tan \theta = \sqrt{3}$

$\qquad\quad \theta = \tan^{-1}\sqrt{3}$

$\qquad\quad \theta = 60, 240$
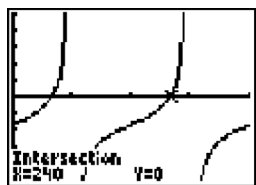
PTS: 2   REF: fall0903a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: basic

4 ANS: 4
Students entering the library are more likely to spend more time studying, creating bias.

PTS: 2   REF: fall0904a2   STA: A2.S.2   TOP: Analysis of Data

5 ANS: 1
$6x - 7 \le 5$ $6x - 7 \ge -5$

$\quad 6x \le 12 \qquad 6x \ge 2$

$\quad\; x \le 2 \qquad\; x \ge \dfrac{1}{3}$

PTS: 2   REF: fall0905a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph

6 ANS: 4
(4) fails the horizontal line test. Not every element of the range corresponds to only one element of the domain.

PTS: 2   REF: fall0906a2   STA: A2.A.43   TOP: Defining Functions

7 ANS: 2

$$K = \frac{1}{2}(10)(18)\sin 120 = 45\sqrt{3} \approx 78$$

PTS: 2   REF: fall0907a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: basic

8 ANS: 4   PTS: 2   REF: fall0908a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

9 ANS: 2

$$8^2 = 64$$

PTS: 2   REF: fall0909a2   STA: A2.A.18   TOP: Evaluating Logarithmic Expressions

10 ANS: 3   PTS: 2   REF: fall0910a2   STA: A2.A.76
TOP: Angle Sum and Difference Identities   KEY: simplifying

11 ANS: 3

n	0	1	2	Σ
$n^2 + 2^n$	$0^2 + 2^0 = 1$	$1^2 + 2^2 = 3$	$2^2 + 2^2 = 8$	12

$2 \times 12 = 24$

PTS: 2   REF: fall0911a2   STA: A2.N.10   TOP: Sigma Notation
KEY: basic

12 ANS: 3

$$S = \frac{-b}{a} = \frac{-(-3)}{4} = \frac{3}{4}. \quad P = \frac{c}{a} = \frac{-8}{4} = -2$$

PTS: 2   REF: fall0912a2   STA: A2.A.21   TOP: Roots of Quadratics
KEY: basic

13 ANS: 3   PTS: 2   REF: fall0913a2   STA: A2.A.65
TOP: Graphing Trigonometric Functions

14 ANS: 1   PTS: 2   REF: fall0914a2   STA: A2.A.9
TOP: Negative and Fractional Exponents

15 ANS: 1
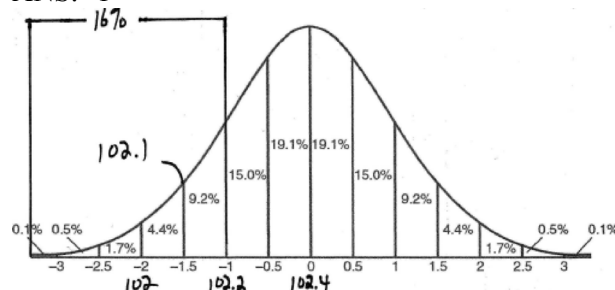
PTS: 2   REF: fall0915a2   STA: A2.S.5   TOP: Normal Distributions
KEY: interval

16 ANS: 2

$f^{-1}(x) = \log_4 x$

PTS: 2   REF: fall0916a2   STA: A2.A.54   TOP: Graphing Logarithmic Functions

17 ANS: 4

$6x - x^3 - x^2 = -x(x^2 + x - 6) = -x(x + 3)(x - 2)$

PTS: 2   REF: fall0917a2   STA: A2.A.7   TOP: Factoring Polynomials
KEY: single variable

18 ANS: 4

$4ab\sqrt{2b} - 3a\sqrt{9b^2}\sqrt{2b} + 7ab\sqrt{6b} = 4ab\sqrt{2b} - 9ab\sqrt{2b} + 7ab\sqrt{6b} = -5ab\sqrt{2b} + 7ab\sqrt{6b}$

PTS: 2   REF: fall0918a2   STA: A2.A.14   TOP: Operations with Radicals
KEY: with variables | index = 2

19 ANS: 1

${}_5C_3(3x)^2(-2)^3 = 10 \cdot 9x^2 \cdot -8 = -720x^2$

PTS: 2   REF: fall0919a2   STA: A2.A.36   TOP: Binomial Expansions

20 ANS: 2

$$\frac{\dfrac{x}{4} - \dfrac{1}{x}}{\dfrac{1}{2x} + \dfrac{1}{4}} = \frac{\dfrac{x^2 - 4}{4x}}{\dfrac{2x + 4}{8x}} = \frac{(x+2)(x-2)}{4x} \times \frac{8x}{2(x+2)} = x - 2$$

PTS: 2   REF: fall0920a2   STA: A2.A.17   TOP: Complex Fractions

21 ANS: 4

$2\log_4(5x) = 3$

$\log_4(5x) = \dfrac{3}{2}$

$5x = 4^{\frac{3}{2}}$

$5x = 8$

$x = \dfrac{8}{5}$

PTS: 2   REF: fall0921a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: advanced

22 ANS: 4

$s = \theta r = 2 \cdot 4 = 8$

PTS: 2   REF: fall0922a2   STA: A2.A.61   TOP: Arc Length
KEY: arc length

23 ANS: 3   PTS: 2   REF: fall0923a2   STA: A2.A.39
TOP: Domain and Range   KEY: real domain

24 ANS: 3

PTS: 2 REF: fall0924a2 STA: A2.S.4 TOP: Dispersion
KEY: variance

25 ANS: 4 PTS: 2 REF: fall0925a2 STA: A2.S.10
TOP: Permutations

26 ANS: 2 PTS: 2 REF: fall0926a2 STA: A2.A.46
TOP: Transformations with Functions and Relations

27 ANS: 4

$y - 2\sin\theta = 3$

$\qquad y = 2\sin\theta + 3$

$\qquad f(\theta) = 2\sin\theta + 3$

PTS: 2 REF: fall0927a2 STA: A2.A.40 TOP: Functional Notation

28 ANS:

$$\frac{5(3+\sqrt{2})}{7}. \quad \frac{5}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{5(3+\sqrt{2})}{9-2} = \frac{5(3+\sqrt{2})}{7}$$

PTS: 2 REF: fall0928a2 STA: A2.N.5 TOP: Rationalizing Denominators

29 ANS:

$$(x+3)^2 + (y-4)^2 = 25$$

PTS: 2 REF: fall0929a2 STA: A2.A.49 TOP: Writing Equations of Circles

30 ANS:

no solution. $\dfrac{4x}{x-3} = 2 + \dfrac{12}{x-3}$

$\qquad\qquad \dfrac{4x-12}{x-3} = 2$

$\qquad\qquad \dfrac{4(x-3)}{x-3} = 2$

$\qquad\qquad\qquad 4 \neq 2$

PTS: 2 REF: fall0930a2 STA: A2.A.23 TOP: Solving Rationals
KEY: rational solutions

31 ANS:

```
3.45*180/π
         197.6704393
Ans▶DMS
    197°40'13.582"
■
```

197º40'. $3.45 \times \dfrac{180}{\pi} \approx 197°40'$.

PTS: 2   REF: fall0931a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

32 ANS:

```
1200e^(.065*10)
         2298.648995
■
```

2,298.65.

PTS: 2   REF: fall0932a2   STA: A2.A.12   TOP: Evaluating Exponential Expressions

33 ANS:

$\dfrac{\sqrt{13}}{2}$. $\sin \theta = \dfrac{y}{\sqrt{x^2 + y^2}} = \dfrac{2}{\sqrt{(-3)^2 + 2^2}} = \dfrac{2}{\sqrt{13}}$. $\csc \theta = \dfrac{\sqrt{13}}{2}$.

PTS: 2   REF: fall0933a2   STA: A2.A.62   TOP: Determining Trigonometric Functions

34 ANS:
$-3, -5, -8, -12$

PTS: 2   REF: fall0934a2   STA: A2.A.33   TOP: Recursive Sequences

35 ANS:

```
9 nCr 2*20 nCr 3
             41040
```

41,040.

PTS: 2   REF: fall0935a2   STA: A2.S.12   TOP: Sample Space

36 ANS:

$3 \pm \sqrt{7}$.

$$2x^2 - 12x + 4 = 0$$
$$x^2 - 6x + 2 = 0$$
$$x^2 - 6x = -2$$
$$x^2 - 6x + 9 = -2 + 9$$
$$(x - 3)^2 = 7$$
$$x - 3 = \pm\sqrt{7}$$
$$x = 3 \pm \sqrt{7}$$

PTS: 4   REF: fall0936a2   STA: A2.A.24   TOP: Completing the Square

37 ANS:

$\pm\dfrac{3}{2}, -\dfrac{1}{2}$.

$$8x^3 + 4x^2 - 18x - 9 = 0$$
$$4x^2(2x + 1) - 9(2x + 1) = 0$$
$$(4x^2 - 9)(2x + 1) = 0$$
$$4x^2 - 9 = 0 \text{ or } 2x + 1 = 0$$
$$(2x + 3)(2x - 3) = 0 \quad x = -\dfrac{1}{2}$$
$$x = \pm\dfrac{3}{2}$$

PTS: 4   REF: fall0937a2   STA: A2.A.26   TOP: Solving Polynomial Equations

38 ANS:

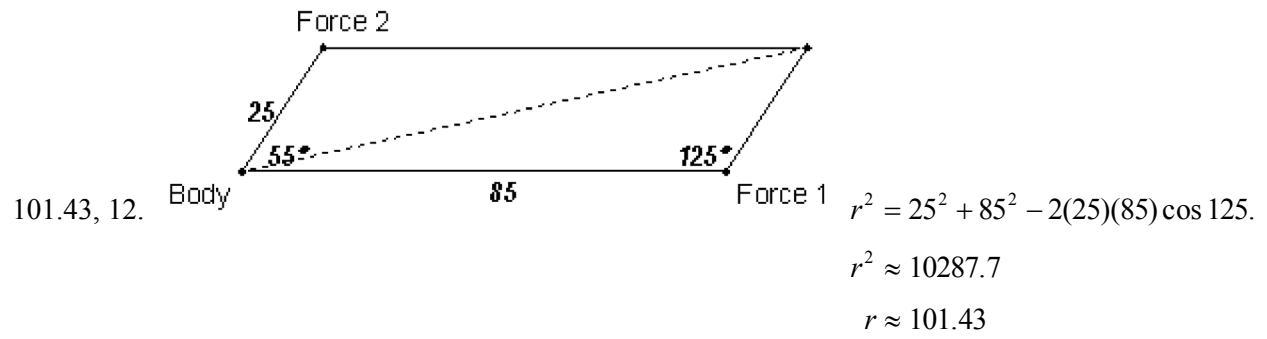$y = 2.001x^{2.298}$, 1,009. $y = 2.001(15)^{2.298} \approx 1009$

PTS: 4   REF: fall0938a2   STA: A2.S.7   TOP: Power Regression

39 ANS:

Force 2

25

55 125

101.43, 12. Body   85   Force 1

$r^2 = 25^2 + 85^2 - 2(25)(85)\cos 125.$

$r^2 \approx 10287.7$

$r \approx 101.43$

$\dfrac{2.5}{\sin x} = \dfrac{101.43}{\sin 125}$

$x \approx 12$

PTS: 6   REF: fall0939a2   STA: A2.A.73   TOP: Vectors