1. Find the value of *m* such that vectors *a* and *b* are orthogonal.

$$a = \langle 4m, 8 \rangle, b = \langle 6, -48 \rangle$$

A. -9

B. 18

C. 9

D. -18

E. None of the above

2. Find the solutions of the equation that are in the interval $[0, 2\pi)$, and approximate the solutions to four decimal places.

$$\cos^2 x - 7\cos x + 5 = 0$$

A. $0.8074, 6.1926$

B. $0.6310, 5.6522$

C. $2.5106, 3.7726$

D. $2.3342, 3.9490$

E. None of the above

3. Given ΔABC with $\alpha = 34°, a = 121\text{cm}, \text{and } c = 181\text{cm},$ to the nearest whole number, find the perimeters of the two triangles that are possible.
[Check the mode on your calculator]

A. $410\text{ cm}, 344\text{ cm}$

B. $518\text{ cm}, 386\text{ cm}$

C. $464\text{ cm}, 344\text{ cm}$

D. $518\text{ cm}, 365\text{ cm}$

E. None of the above

4. The bearing from Point A to Point B is $N33°E$ and the bearing from Point A to Point C is $N33°W$. The distance from A to B is 300 miles and the distance from B to C is 400 miles. To the nearest mile, how far is it from Point A to Point C?

   A. 437 miles

   B. 399 miles

   C. 500 miles

   D. 413 miles

   E. None of the above

5. To the nearest tenth of a degree, approximate the smallest angle in the ΔABC with $a = 12\,\text{cm}, b = 15\,\text{cm}$ and $c = 20\,\text{cm},$.

   A. 36.7°

   B. 48.3°

   C. 46.6°

   D. 33.5°

   E. None of the above

6. A plane leaves Point A and flies in the direction 30° for 100 miles and then flies in the direction 160° for 200 miles. To the nearest mile, how far is the plane from Point A?

   A. 224 miles

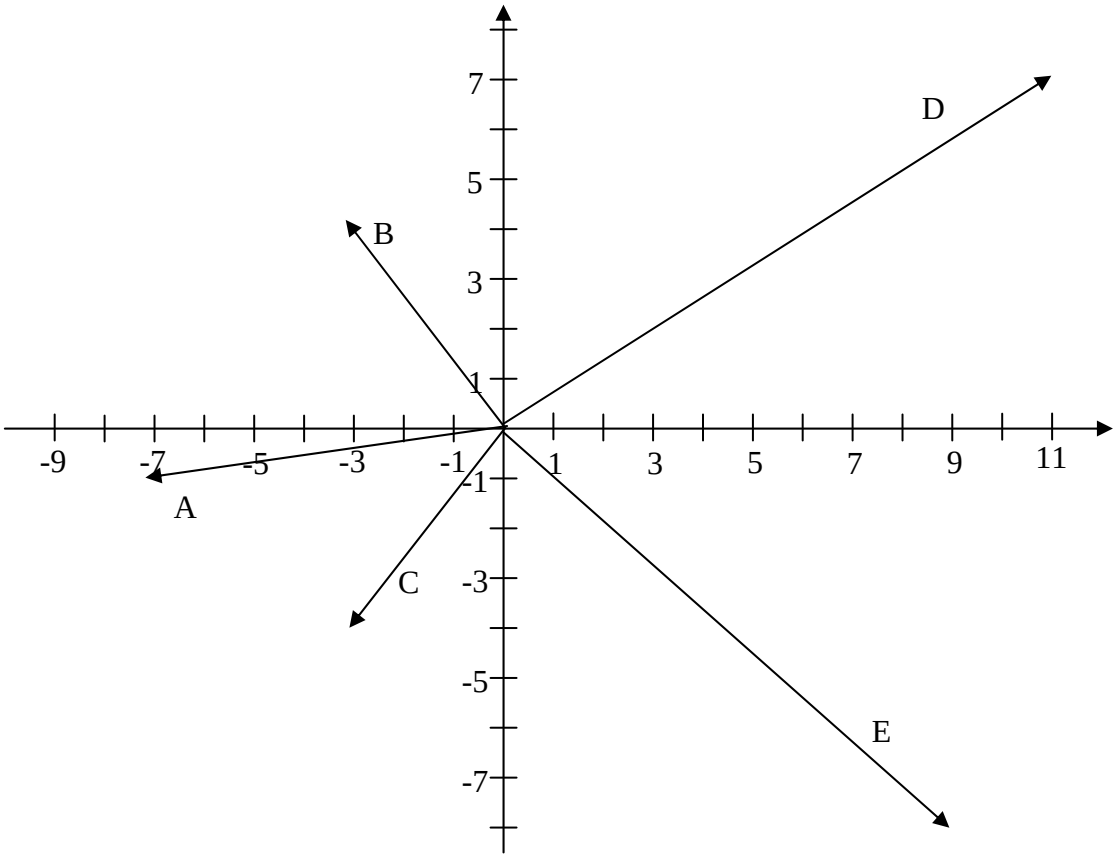
   B. 156 miles

   C. 103 miles

   D. 161 miles

   E. None of the above

7. Given vectors $a = i - 2j, b = -3i + j$, which of the vectors below best represents $3a - 2b$?



8. The magnitude and direction of two forces acting at a point *P* are given in (*a*) and (*b*). To the nearest tenth of a unit, approximate the magnitude and direction of the resultant vector.

$a = 105 \text{ lb}, 200°$ and $b = 210 \text{ lb}, 315°$

A. 191.0 lb, 229.9°

B. 271.6 lb, 285.1°

C. 271.6 lb, 229.9°

D. 191.0 lb, 285.1°

E. None of the above

9. Find a unit vector that is in the same direction as $a = \langle 11, -60 \rangle$

A. $u = \left\langle \frac{11}{61}, \frac{-60}{61} \right\rangle$

B. $u = \left\langle \frac{-11}{61}, \frac{60}{61} \right\rangle$

C. $u = \left\langle \frac{11}{61}, \frac{60}{61} \right\rangle$

D. $u = \left\langle \frac{-11}{61}, \frac{-60}{61} \right\rangle$

E. None of the above

10. Given $a = 4i + 5j,\ b = -2i - 3j,$ and $c = i - 8j$, find $(2a + b) \bullet 3c$

A. 150

B. $9i - 17j$

C. -150

D. $-9i + 17j$

E. None of the above

11. Which of the following statements about the function $f(x) = \frac{x-6}{x^2 + 2x - 3}$ is/are true?

I. Horizontal Asymptote is $y = 0$

II. Vertical Asymptotes are $x = -3, x = 1$

III. y-intercept is $(0, 2)$

A. Only I and II

B. Only II and III

C. Only I and III

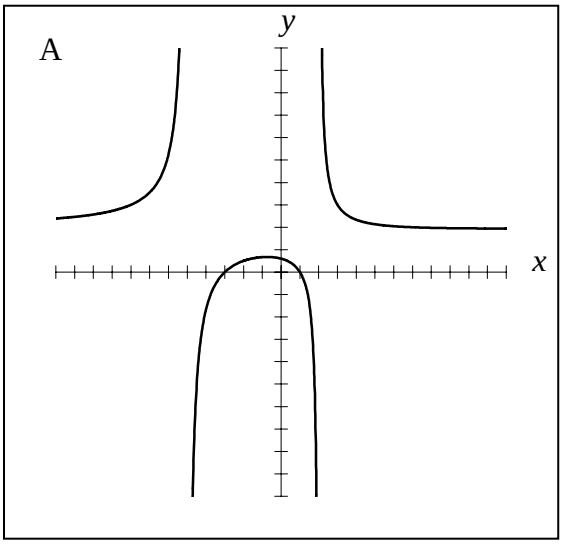
D. All three are true

E. None are true

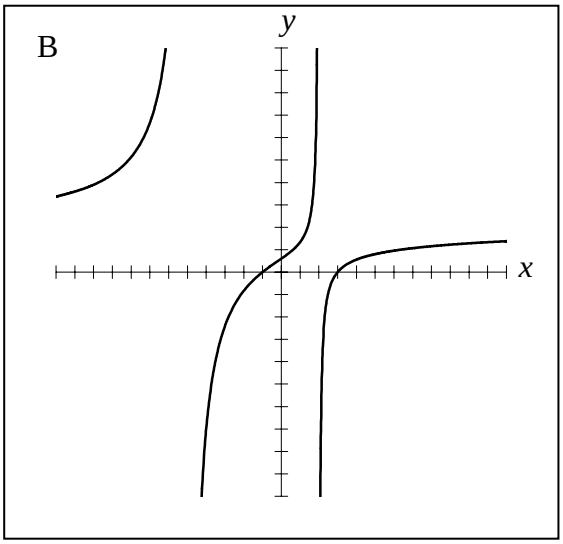
12. Which of the following best represents the graph of the function $f(x)=\dfrac{2x^2+4x-6}{x^2+3x-10}$?

Assume that all hash marks represent one unit.

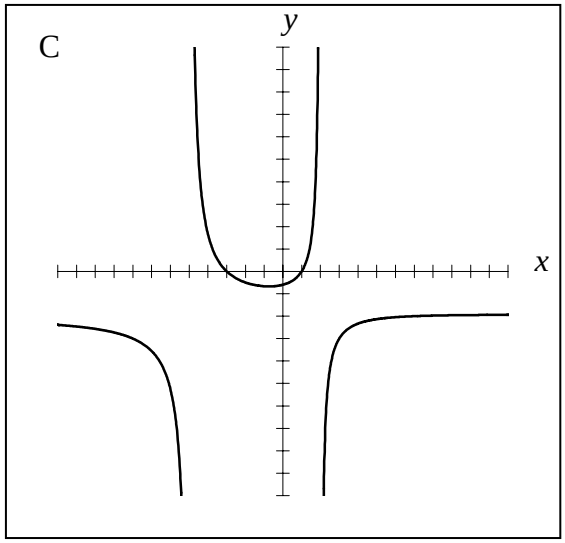
A



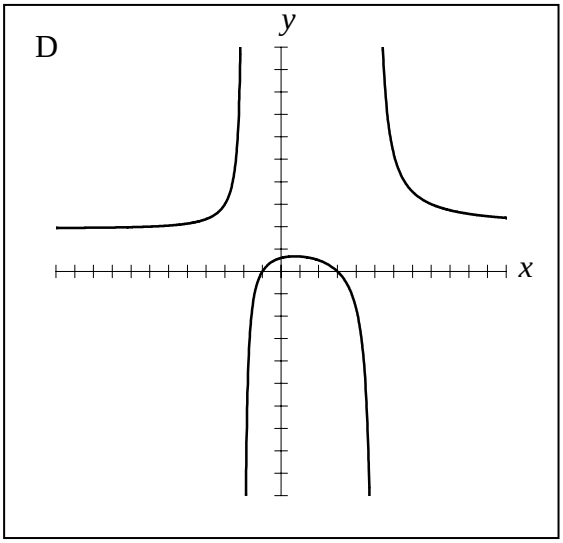
B



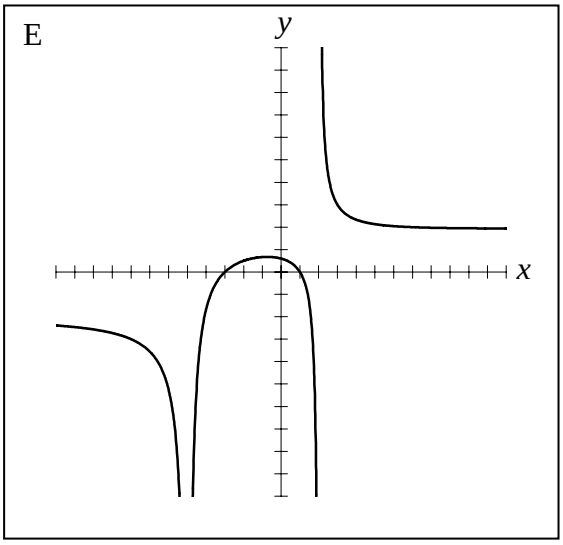
C



D



E



13. Find an equation of a rational function that satisfies the given conditions.

Horizontal Asymptote: $y = \frac{-3}{2}$
Vertical Asymptotes: $x = 5, x = -2$
x-intercepts: $4, -9$
Hole at $x = 7$

A. $f(x) = \frac{-3(x+4)(x-9)(x+7)}{2(x+5)(x-2)(x+7)}$

B. $f(x) = \frac{-3(x-4)(x+9)(x-7)}{2(x-5)(x+2)(x-7)}$

C. $f(x) = \frac{-3(x+5)(x-2)(x+7)}{2(x+4)(x-9)(x+7)}$

D. $f(x) = \frac{-3(x-5)(x+2)(x-7)}{2(x-4)(x+9)(x-7)}$

E. None of the above

14. Find an equation for the parabola that satisfies the given conditions.

Vertex: V(2, 3)
Focus: F(2, 0)

A. $(x-2)^2 = -8(y-3)$

B. $(y-3)^2 = -2(x-2)$

C. $(y-3)^2 = 8(x-2)$

D. $(x-2)^2 = 2(y-3)$

E. None of the above

15. Find the vertex of the parabola with the equation $y^2 - 14y - 2x - 11 = 0$.

A. $(-30, -7)$

B. $(30, -7)$

C. $(-30, 7)$

D. $(30, 7)$

E. None of the above

	Answer	
1.	16	E
2.	$0.6310, 5.6522$	B
3.	$518\,\text{cm}, 386\,\text{cm}$	B
4.	413 miles	D
5.	$36.7°$	A
6.	156 miles	B
7.	$3a-2b=9i-8j$	E
8.	191.0 lb, $285.1°$	D
9.	$u=\left\langle \frac{11}{61}, \frac{-60}{61} \right\rangle$	A
10.	-150	C
11.	All three are true	D
12.	<See Exam>	A
13.	$f(x)=\frac{-3(x-4)(x+9)(x-7)}{2(x-5)(x+2)(x-7)}$	B
14.	$(x-2)^2=-12(y-3)$	E
15.	$(-30,7)$	C