**1.** Let $g(x) = 7x - 2$ and $f(x) = x^2 - 3$.

　a) Find the domain of $\dfrac{f(x)}{g(x)}$.

　b) Find $f(4) - g(4)$.

　c) Find a formula for $(f \circ g)(x)$.

　d) Find a formula for g^{-1}.

2. Factor the polynomial $f(x) = x^3 - 4x^2 - 4x + 16$ into a product of three **linear** factors. Calculator answers will not receive full credit. (Hint: 2 is a zero.)

3. Find all real numbers x which satisfy the inequality: $x^2 + 8 > -6x$. Answer using interval notation.

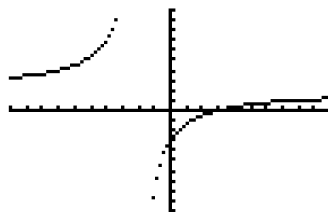**4.** Suppose that the picture below is the graph of $y = f(x)$.

For each of the graphs below, write the letter that corresponds to the correct transformation of f.

　A) $y = \dfrac{1}{2}f(x)$　　　　　B) $y = f(x + 3)$　　　　　C) $y = -f(x)$

　D) $y = f(x) + 3$　　　　　E) $y = -f(x) + 3$　　　　　F) $y = f(x - 3)$
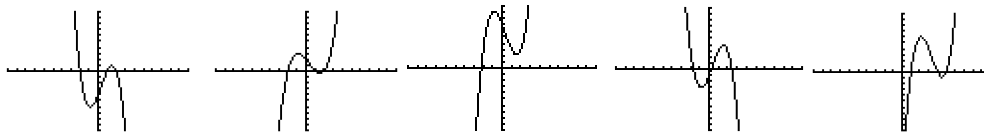
5. Find the formula for the rational function f determined by the given graph.
(Hint: You must use the information about the asymptotes and intercepts.)

6. a) Sketch the graph $f(x) = \log(x+5) + 2$. Be sure to label all the intercepts and asymptotes if any. Give your answers with 2 decimal place accuracy.

b) Which of the following is the graph of f^{-1}, the inverse function of f? Circle your answer.
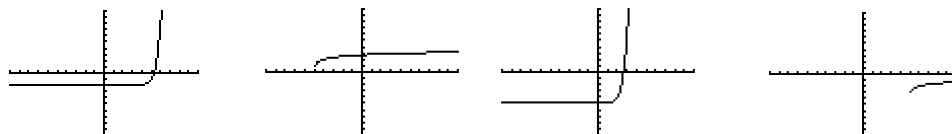
7. Suppose that q, j are acute angles with $\cos(q) = \frac{3}{4}$ and $\sin(j) = \frac{1}{3}$. Determine the **exact** value for $\cos(q + j)$.

8. A certain angle φ has $\cos(\varphi) = .2626$ and $\sin(\varphi) < 0$.

a) If φ is in standard position, which Quadrant contains the terminal side of angle φ

b) Find all the possible values, in radians, for φ. (Hint: Your answer should include an integer k.)

9. a) Determine the amplitude, period, and phase shift for $y = 2\sin\left(px - \dfrac{p}{3}\right)$.

b) If $f(x) = A\sin(Bx + C)$ has a period of 2, an amplitude of 6, and a phase shift of -1, find A, B and C. (Assume that A, B, and C are positive.)

10. Algebraically verify the identity.
$$\frac{(1 - \sin x)(1 + \sin x)}{1 - \cos^2 x} = \cot^2 x$$

11. Given $\mathbf{u} = \langle -1, 2 \rangle$ and $\mathbf{v} = \langle 3, -2 \rangle$.

a) Find the magnitude, $|\mathbf{v}|$.

b) Find $2\mathbf{u} - \mathbf{v}$.

c) Find the unit vector in the same direction as $\mathbf{u}$.

12. Suppose $\mathbf{u}$ and $\mathbf{v}$ are vectors which are perpendicular, having $|\mathbf{u} + \mathbf{v}| = 32$ and the angle between $\mathbf{u} + \mathbf{v}$ and $\mathbf{u}$ is $22°$. Find the lengths $|\mathbf{u}|$ and $|\mathbf{v}|$.

13. Given that q is in the interval $\left[0, \dfrac{p}{2}\right]$, use **algebraic methods** to solve the trigonometric equation

$2\cos^2 q = \sin 2q$. Exact answers are required.

14. a) Convert the rectangular coordinates point $(3, 8)$ to polar coordinates. (Answer should be accurate to 2 decimal places.)

b) Convert the equation $r = 2\cos q$ to rectangular form.

c) Convert $x = y^2$ to polar form.

15. a) Let $z = 5 + 3i$ and $w = 7 - 4i$, compute zw.

b) Convert the complex number $-1 + i\sqrt{3}$ to polar form. Give the exact values of r and q, with q in radians.

c) Convert the complex number $2e^{(p/6)i}$ to rectangular form.