

College Algebra and Precalculus questions for placement test practice

1. Simplify.

$$\frac{\frac{5}{a} - \frac{4}{b}}{\frac{8}{b} - \frac{10}{a}}$$

2. Find the domain of the function. State the domain in interval notation.

$$f(x) = \frac{x^2 + 3x + 2}{\sqrt{2 - x}}$$

3. Let $f(x) = \frac{3}{x^2 - 1}$ and $g(x) = x + 1$ find $(f \circ g)(x)$.

4. Write the equation $a^b = c$ in logarithmic form.

5. Use properties of logarithms to write as the logarithm of a single quantity.

$$\frac{1}{4} [2\ln(x) + \ln(x-1) - \ln(x^2 - 1)]$$

6. Use properties of logarithms to expand into the sum/difference/multiples of single logarithm. Simplify logarithms if possible.

$$\ln\left(\frac{\sqrt{5y}}{z^2}\right)$$

7. Solve for x (where necessary, round answers to 4 decimal places).

(a) $2^{x-1} + 9 = 32$

(b) $\ln(x+1) - \ln(x-1) = 1$

8. State the reference angle and the exact function value.

$$\cot \frac{3\pi}{4}$$

9. Solve the equation (state all solutions).

(a) $4\cos x = 1 + 2\cos x$

10. Solve the triangle ABC if $a = 54$ cm, $b = 62$ cm, and $A = 40^\circ$.

11. Solve the triangle ABC if $a = 34$ km, $b = 20$ km, and $c = 18$ km.

12. For the function $f(x) = x^2 - 3x$, evaluate and simplify the difference quotient

$$\frac{f(x + \Delta x) - f(x)}{\Delta x}.$$

13. For $f(x) = x - 2$ and $g(x) = \sqrt{x}$, find $(g^{-1} \circ f)(4)$.

14. Determine the exact value, in radians, of $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right)$

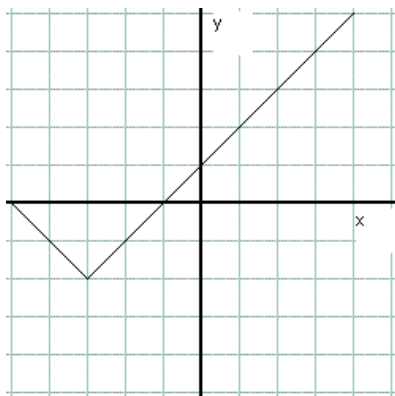
15. Use the fact that $\frac{5\pi}{12} = \frac{\pi}{6} + \frac{\pi}{4}$ to find the exact value of $\cos\left(\frac{5\pi}{12}\right)$.

16. Find the exact value of $\sin(x + y)$ if $\sin x = \frac{2}{7}$, $\frac{\pi}{2} < x < \pi$ and $\cos y = -\frac{3}{5}$, $\pi < y < \frac{3\pi}{2}$

17. Solve for x in $[0, 2\pi)$. State exact forms of answers.

$$3 \tan^4 x - 10 \tan^2 x = -3$$

18. Shown is the graph of $y = f(x)$. Use it to sketch the graph of $f(x - 1) + 3$.



19. Complete the square to write the quadratic function $f(x) = -2x^2 + 12x - 14$ in the form $f(x) = a(x - h)^2 + k$.

20. Divide by long division.

$$\frac{6x^4 + 10x^3 + 13x^2 - 5x + 2}{2x^2 - 1}$$

21. Perform the indicated operations.

$$(2 - 3i)(-4 + 5i)$$

22. Find all zeros (in exact form) and factor completely over the complex numbers.

$$f(x) = 2x^3 - 5x^2 + 6x - 2$$

23. Find a polynomial function with integer coefficients that has zeros of $\frac{1}{2}$, 2 and $3 - 2i$.
(Answer in general form – descending powers of variables).

24. Find the vertical asymptote and the coordinates of the hole for the function.

$$f(x) = \frac{x + 1}{x^2 - 2x - 3}$$

Answers to College Algebra and Precalculus questions for placement test practice

1. $-\frac{1}{2}$

2. $(-\infty, 2)$

3. $\frac{3}{x^2 + 2x}$

4. $\log_a c = b$

5. $\ln \sqrt[4]{\frac{x^2}{x+1}}$

6. $\frac{1}{2} \ln 5 + \frac{1}{2} \ln y - 2 \ln z$

7. (a) 5.5236

(b) $\frac{e+1}{e-1} \approx 2.1640$

8. $\frac{\pi}{4}, -1$

9. $\frac{\pi}{3} + 2k\pi, \frac{5\pi}{3} + 2k\pi$, where k is any integer

10. $B \approx 48^\circ, C \approx 92^\circ, c \approx 84$ cm
 $B' \approx 132^\circ, C' \approx 8^\circ, c' \approx 12$ cm

11. $A \approx 127^\circ, B \approx 25^\circ, C \approx 28^\circ$

12. $2x - 3 + \Delta x$

13. $(g^{-1} \circ f)(4) = 4$

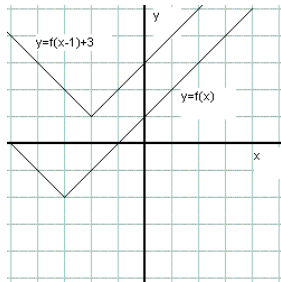
14. $\frac{\pi}{4}$

15. $\frac{\sqrt{6} - \sqrt{2}}{4}$

$$16. \frac{-6+12\sqrt{5}}{35}$$

$$17. \frac{\pi}{6}, \frac{\pi}{3}, \frac{2\pi}{3}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{4\pi}{3}, \frac{5\pi}{3}, \frac{11\pi}{6}$$

18.



$$19. f(x) = -2(x-3)^2 + 4$$

$$20. 3x^2 + 5x + 8, \text{ remainder } 10$$

$$21. 7 + 22i$$

$$22. \text{ zeros: } \frac{1}{2}, 1 \pm i$$

factorization:

$$(2x-1)(x-(1+i))(x-(1-i))$$

$$23. f(x) = 2x^4 - 15x^3 + 42x^2 - 27x - 26$$

$$24. \text{ vertical asymptote: } x = 3, \text{ hole: } \left(-1, -\frac{1}{4}\right)$$