

Texas A&M University
MPE1 Math Placement Exam Practice Problems

1. Rationalize the denominator.

$$\frac{14}{3 + \sqrt{2}}$$

2. Find the sum or difference as indicated, and write your answer in simplified form.

$$\frac{x + 2a - 3}{x + a} - \frac{x + 6}{2x}$$

3. Factor and reduce to simplest form.

$$\frac{6x^2 + 11xy - 10y^2}{3x^2 + 10xy - 8y^2}$$

4. Simplify the following completely.

$$\frac{(x^{-4}y^{2/5})^{-3/4}}{x^{2/3}y^{-5/6}}$$

5. Solve the following equation.

$$5(x - 7) - 13(x - 7) - 6 = 0$$

6. Find the point (x, y) which satisfies both equations. What is the value of $x + y$?

$$-2x + 4y = 12$$

$$3x - 5y = -3$$

7. Two investments are made, totaling \$10,000. In one year, these investments yield \$650 in simple interest. Part of the \$10,000 is invested at $5\frac{1}{2}\%$, and the rest at $6\frac{3}{4}\%$. How much more money is invested at $6\frac{3}{4}\%$?

8. Given the linear equation $2ax + 3by = 7c$, where a, b and $c > 0$, if x decreases by 10 units, what is the corresponding change in y ?

9. Line A passes through the points $(2k+3, 4k-6)$ and $(-2, 16)$. Find the value of k if line A has a slope of 0.

10. Jay wants to make a box, with no lid (or top), out of a 10" x 6" rectangular piece of cardboard. If Jay cuts squares with dimensions x by x out of each corner of the cardboard, and then folds up the corners to make an open box, find a function that represents:

- (a) The volume of the box.
(b) The surface area of the box.

11. Solve for x in the inequality $\frac{5x + 2}{x - 10} \geq 3$.

12. Find the domain of the function below.

$$f(x) = \frac{\sqrt{x^2 - 3x - 4}}{6x^2 - 54}$$

13. Find the domain of the function below.

$$f(x) = \begin{cases} \frac{2x^2 + 13}{x^2 - 1}, & x < 0 \\ \frac{5x - 26}{x + 2}, & x \geq 0 \end{cases}$$

14. Find the x -intercept(s) of the function

$$f(x) = \frac{6x^2 - 7x - 5}{4x^2 - 12x - 7}, \text{ if any exist.}$$

15. Find the vertical and horizontal asymptote(s) of the function $f(x) = \frac{6x^2 - 7x - 5}{4x^2 - 12x - 7}$, if any exist.

16. Find the x - and y -intercepts for the function $f(x) = x^3 - 9x$.

17. Find the domain of the following functions:

(a) $f(x) = \sqrt{-x^2 - 4x + 5}$

(b) $g(t) = \ln(4t - 3)$

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

18. Simplify the expression $\frac{2}{\sqrt{x^5}} \left(\sqrt[3]{4x} \right)$.

19. If we begin with the graph of $f(x) = x^2$ and shift $f(x)$ 4 units to the right, shrink $f(x)$ vertically by a factor of $\frac{1}{2}$, and then shift $f(x)$ upward 10 units, write the equation for the transformed graph.

20. Solve the following equation for x .
 $\log(x + 2) + \log(x - 1) = 1$

21. Factor the expression below completely.
 $3x^2(4x^2 + 1)^8 + 64x^4(4x^2 + 1)^7$

22. How far from the base of an 18 foot tall pole must a person be standing if the angle of elevation from the ground to the pole is 41° ?

23. Find $f \circ g$ (also denoted $f(g(x))$) if $f(x) = \frac{x}{x + 1}$ and $g(x) = \frac{2}{x}$. Simplify.

24. Perform the indicated operations and simplify.
 $\frac{8}{x + 1} - \left(\frac{y}{z + 2} \div \frac{y - 4}{w} \right)$

25. Solve the equation $e^{2x} - 2e^x - 3 = 0$ for x .
26. Find the equation of the line passing through the point (5,1) with a slope of 7. Use the equation you find to determine the value of y when $x = -4$.
27. If $f(x) = \sqrt{x+4}$, find and simplify $\frac{f(2+h) - f(2)}{h}$.
28. Simplify $\frac{(x^2y^4)^5(x^3y)^{-3}}{xy}$.
29. Simplify $\sqrt[3]{(a^3b)^3}\sqrt[3]{64a^4b^2}$.
30. Perform the operations indicated and simplify.

$$\frac{x^2}{x^2 - x - 2} - \frac{4}{x^2 + x - 6} + \frac{x}{x^2 + 4x + 3}$$
31. Find all zeros, horizontal, and vertical asymptotes for $f(x) = \frac{3x^2 - 14x - 5}{4x^2 - 17x - 15}$.
32. If θ is in Quadrant II, and $\sin(\theta) = \frac{1}{7}$, what is $\cos(\theta)$?
33. Use the properties of logarithms to expand the expression $\ln\left(\frac{\sqrt{xy^5}}{(z+1)^4}\right)$.
34. Evaluate $\sec\frac{2\pi}{3} - \tan\frac{\pi}{6}$.
35. If we begin with a rectangle with length 5 inches and width 4 inches, then increase the length by 8%, what is the change in area?
36. Evaluate $f(2) - f(-3)$ given $f(x) = \begin{cases} x^3 + 1, & x > 1 \\ 2x^2 - 3, & x \leq 1 \end{cases}$
37. Simplify the expression $\frac{\cos^2(\theta)}{1 + \sin(\theta)}$.
38. Evaluate $\log_4\left(\frac{1}{\sqrt[3]{16}}\right)$.
39. Simplify $\frac{\frac{1}{a} - b}{\frac{1}{b^3} + a}$.
40. A bacteria culture contains 1200 bacteria and doubles every day. How many hours will it take the culture to reach 10000 bacteria?