



Mathematics 12 Level
Challenge Exam
For

MECH

PRACTICE VERSION ONLY

Each question is followed by five possible answers labeled (a) through (e).
Select the one best answer to each question.

Calculators are **not** permitted.

You should be able to complete this practice test in approximately 60 minutes. The real test contains 60 multiple choice questions with a time limit of 90 minutes.

1. $3[4 - 3(6 - 7)] =$
a) -3 b) 0 c) 9 d) 15 e) 21
-

2. $\frac{1}{u} - \frac{5}{v} =$
a) $\frac{-4}{u-v}$ b) $\frac{-4}{u+v}$ c) $\frac{v-5u}{uv}$ d) $\frac{-4}{uv}$ e) $\frac{u-5v}{uv}$
-

3. The graph of $x - 4y + 8 = 0$ crosses the y-axis at $y =$
a) -8 b) -2 c) 0 d) 2 e) 8
-

4. If $5x - 10 = 2 - 2x$, then $x =$
a) $-\frac{12}{7}$ b) $-\frac{8}{7}$ c) $\frac{8}{7}$ d) $\frac{12}{7}$ e) 4
-

5. $(4x^2y)(-3x^5y^4) =$
a) $-12x^7y^5$ b) $-12x^{10}y^4$ c) $x^{-3}y^{-3}$ d) $-12x^7y^4$ e) $x^{10}y^4$
-

6. $\frac{3}{3 + \frac{1}{2}} =$
a) $\frac{3}{4}$ b) $\frac{6}{7}$ c) $\frac{4}{3}$ d) $\frac{3}{2}$ e) 2
-

7. $\frac{8}{\sqrt{10}} =$
a) $\sqrt{\frac{4}{5}}$ b) $\frac{4\sqrt{10}}{5}$ c) $\frac{\sqrt{10}}{8}$ d) $\frac{4}{\sqrt{5}}$ e) $\frac{\sqrt{5}}{4}$
-

8. $\sqrt{50x^8y^{12}} =$
a) $5x^4y^6\sqrt{2}$ b) $25x^8y^{12}$ c) $25x^4y^6$ d) $5x^6y^{10}\sqrt{2}$ e) $5x^4y^6$
-

9. The x -coordinate of the solution of the system of equations $\begin{cases} 3x+6y=4 \\ x-3y=1 \end{cases}$ is

a) $\frac{1}{15}$ b) $\frac{1}{3}$ c) 1 d) $\frac{6}{5}$ e) $\frac{5}{3}$

10. If $a=4$ and $b=-3$, then $|a-b|$ =

a) -7 b) -1 c) 1 d) 7 e) 12

11. $\frac{6m^2+3m}{3m} =$

a) $2m+1$ b) $6m^2$ c) $3m$ d) $6m^2+1$ e) $5m$

12. The length L of a spring is given by $L = \frac{3}{4}F + 8$ where F is the applied force. What force F will produce a length of 10?

a) $\frac{8}{3}$ b) $\frac{16}{3}$ c) $\frac{32}{3}$ d) $\frac{31}{2}$ e) 24

13. $\left(\frac{3y}{x^4}\right)^{-3} =$

a) $\frac{27y^3}{x^{12}}$ b) $\frac{x^{12}}{27y^3}$ c) $\frac{x^{12}y^3}{27}$ d) $\frac{3y^3}{x^{12}}$ e) $27y^3x^{12}$

14. $\frac{x^2-9}{3x} \cdot \frac{12}{2x-6}$

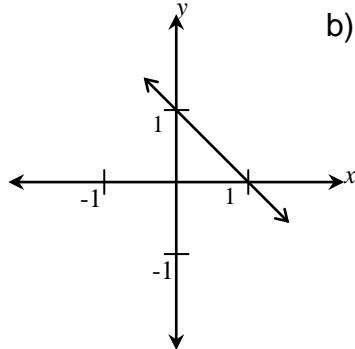
a) -3 b) 6 c) $2(x+3)$ d) $\frac{2(x-3)}{x}$ e) $\frac{2(x+3)}{x}$

15. If $\frac{1}{x-3} + 7 = \frac{x}{x-3}$, then $x =$

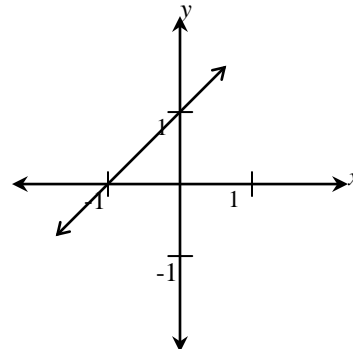
a) $-\frac{10}{3}$ b) $-\frac{1}{3}$ c) $\frac{1}{3}$ d) $\frac{10}{3}$ e) 8

16. The graph of $x + y = 1$ is

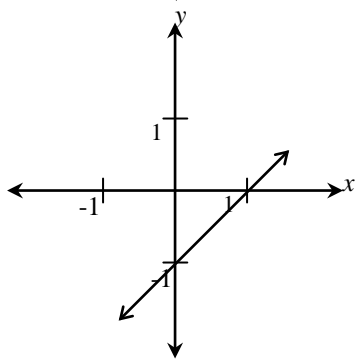
a)



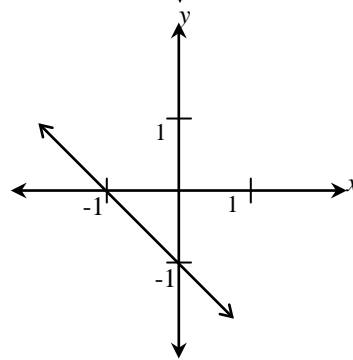
b)



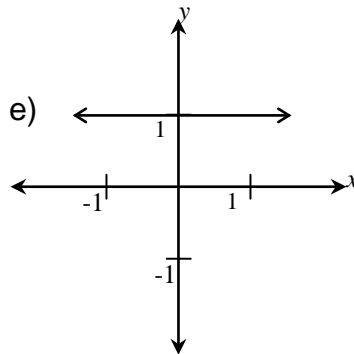
c)



d)

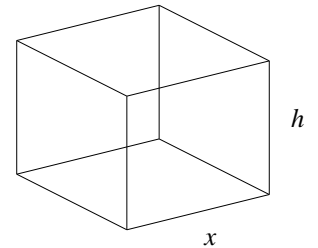


e)



17. The box pictured on the right has a square base and an open top.
Express its surface area in terms of x and h .

- a) hx^2 b) $x^2 + 4xh$ c) $2x + h$ d) $4x + 4h$ e) $8x + 4h$



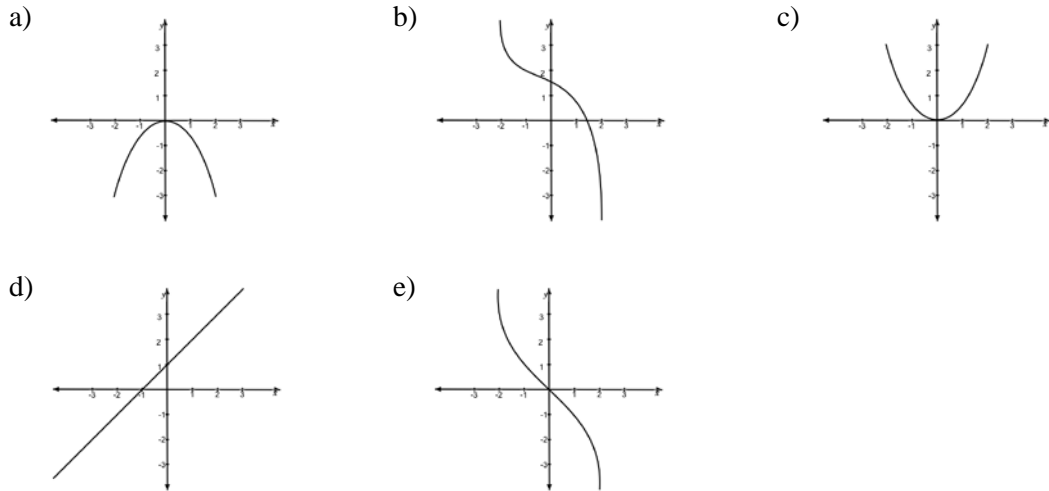
18. If money in a bank triples every 10 years, then by what factor does it increase over a 30 year period?

- a) 3 b) 6 c) 9 d) 27 e) 30

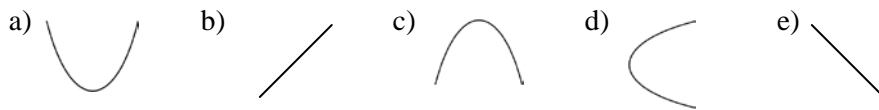
19. $8^{1/3}16^{-1/2} =$

- a) -8 b) $(128)^{-1/6}$ c) $\frac{1}{2}$ d) 2 e) 8

20. Definition: A function is *odd* if $f(-x) = -f(x)$ for each x in the domain of f . Which of the functions whose graphs are shown is odd?



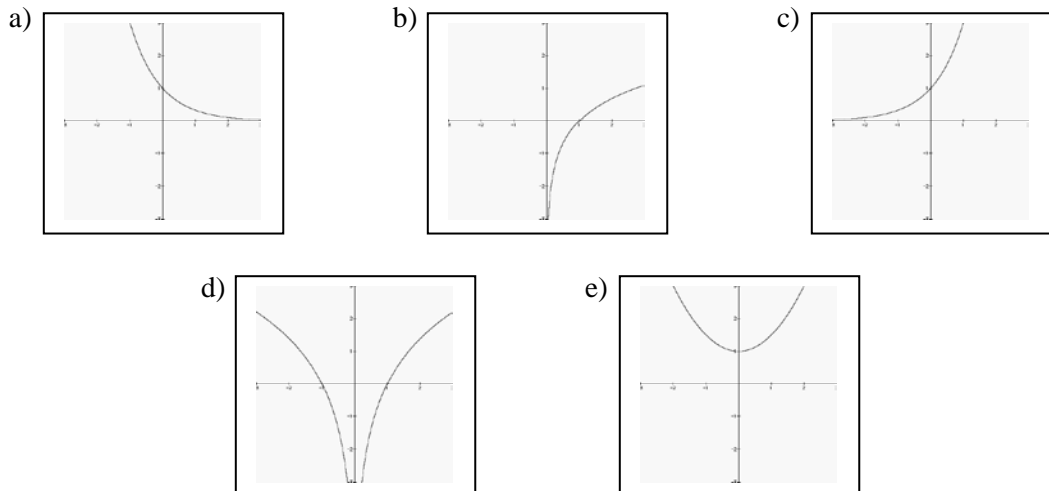
21. Which of the following best resembles the graph of $y = -\frac{1}{2} + 3x + x^2$



22. If $\log_4(x+1) = 3$ then $x =$

- a) 2 b) 11 c) 63 d) 80 e) $\frac{3}{\log_4} - 1$

23. Which of the following curves best resembles the graph of $f(x) = 3^{-x}$?



24. If the point A has coordinates $(-4, 2)$ and the point C has coordinates $(5, 14)$, then the distance from A to C in the xy -plane is

- a) 9 b) 12 c) 13 d) 15 e) 25
-

25. Suppose the sides of a rectangle with length x and width y are each tripled. The increase in area of the rectangle is:

- a) $2xy$ b) $3xy$ c) $8xy$ d) $9xy$ e) x^3y^3
-

26. $|x - 4| < 2$ is equivalent to

- a) $x > 6$ b) $x < 6$ c) $-2 < x < 6$ d) $2 < x < 6$ e) $2 < x < 4$
-

27. y varies inversely as the square root of x . When $x = 25$, $y = 4$. What is the value of y when $x = 100$?

- a) 0.25 b) 2 c) 4 d) 8 e) 10
-

28. The solution set of the inequality $x^2 + 4x - 5 < 0$ is

- a) $x < 1$ b) $x > -5$ c) $x > 4$ or $x < -5$ d) $x > 1$ or $x < -5$ e) $-5 < x < 1$
-

29. The equation $|x^2 - 4| = -1$ has how many distinct real number solutions?

- a) 0 b) 1 c) 2 d) 4 e) more than 4
-

30. $\frac{x+1}{\sqrt{x+2}} - \sqrt{x+2}$ simplifies to

- a) -1 b) $\frac{-1}{\sqrt{x+2}}$ c) $\frac{3}{\sqrt{x+2}}$ d) $\frac{-2}{x+2}$ e) $\frac{x^2+x-1}{x+2}$
-

31. $x = \log_5(3000)$ satisfies

- a) $2 < x < 3$ b) $3 < x < 4$ c) $4 < x < 5$ d) $5 < x < 6$ e) $x > 6$
-

32. If $f(x) = \frac{2x+6}{x+2}$, then $f(a+2) =$

- a) $\frac{5}{2}$ b) $\frac{2a+8}{a+4}$ c) $\frac{2a+10}{a+4}$ d) $\frac{2a+6}{a+2}$ e) $\frac{2a+6}{a+4}$
-

33. The domain of the function $g(x) = \sqrt{1-x^2}$ is

- a) $[0, \infty)$ b) $[1, \infty)$ c) $[0,1]$ d) $[-1,1]$ e) $(-\infty, \infty)$
-

34. If $g(x) = x^2 - 2$ and $f(x) = 4x + 2$ and if $g \circ f$ indicates the composition of g with f , then $(g \circ f)(1) =$

- a) -18 b) -6 c) -2 d) 34 e) none of these
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35. If $f(x) = \frac{1}{x}$ and $h \neq 0$, then $\frac{f(x+h) - f(x)}{h} =$

- a) -1 b) 1 c) $\frac{1}{h^2}$ d) $\frac{1}{x(x+h)}$ e) $\frac{-1}{x(x+h)}$
-

36. $\sin(60^\circ) =$

- a) 0 b) 1 c) $\frac{1}{2}$ d) $\frac{\sqrt{3}}{2}$ e) $\frac{1}{\sqrt{2}}$

Assume **radian measure** in Questions 37 – 40.

37. $\cos^2 \theta - 1 =$

- a) $-\sin^2 \theta$ b) $\sin^2 \theta$ c) $\sin \theta$ d) $\sec^2 \theta$ e) $-\cos(2\theta)$
-

38. If $f(x) = \tan(3x)$, then $f\left(\frac{\pi}{6}\right) =$

- a) undefined b) 0 c) $\frac{1}{2}$ d) $\frac{\sqrt{3}}{2}$ e) 1
-

39. For which value of x is $\sec(x)$ not defined?

- a) $-\pi$ b) $-\frac{\pi}{2}$ c) 0 d) $\frac{\pi}{4}$ e) $\frac{\pi}{3}$
-

40. $\cos \alpha \tan \alpha \csc^2 \alpha =$

- a) $\tan(\alpha)$ b) $\sin(\alpha)$ c) $\sec(\alpha)\tan(\alpha)$ d) $\csc(\alpha)$ e) $\frac{\cos^4(\alpha)}{\sin(\alpha)}$
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ANSWER SHEET FOR
MATHEMATICS 12 **PRACTICE** EXAM (FOR **MECH**)

- | | |
|-------|-------|
| 1. E | 21. A |
| 2. C | 22. C |
| 3. D | 23. A |
| 4. D | 24. D |
| 5. A | 25. C |
| 6. B | 26. D |
| 7. B | 27. B |
| 8. A | 28. E |
| 9. D | 29. A |
| 10. D | 30. B |
| 11. A | 31. C |
| 12. A | 32. C |
| 13. B | 33. D |
| 14. E | 34. D |
| 15. D | 35. E |
| 16. A | 36. D |
| 17. B | 37. A |
| 18. D | 38. A |
| 19. C | 39. B |
| 20. E | 40. D |