

Practice test 1

The actual exam will consist of 6 multiple choice questions and 6 regular problems.
You will have 1 hour to complete the exam.

Multiple choice questions: circle the correct answer

- The function $f(x) = \sin(x) + x^2$ is
A. even B. odd C. periodic with period 2π D. discontinuous at 0
E. None of the above
- If we shift the graph of $y = \sin(x)$ 2 units to the left, then the equation of the new graph is
A. $y = \sin(x) + 2$ B. $y = \sin(x) - 2$ C. $y = \sin(x + 2)$ D. $y = \sin(x - 2)$
E. $y = \sin(x/2)$
- The domain of the function $f(x) = \sqrt{\frac{1}{9-x^2}} + \sqrt{x-1}$ is the set of all real numbers x for which
A. $x < -3$ or $x > 3$ B. $x < 3$ C. $x \geq 1$ D. $1 \leq x < 3$ E. $1 < x < 3$
- $\lim_{x \rightarrow -1^-} \frac{|x+1|}{x+1} =$
A. 1 B. -1 C. 0 D. $-\infty$ E. Does not exist
- The function $f(x) = \begin{cases} -x-1 & \text{if } x < -1 \\ 0 & \text{if } -1 \leq x \leq 1 \\ x & \text{if } x > 1 \end{cases}$ is
A. continuous everywhere
B. continuous at 1 but discontinuous at -1
C. continuous at -1 but discontinuous at 1
D. continuous at all points except for 1 and -1
E. discontinuous everywhere
- Find the equation of the line tangent to the curve $y = x^2 + 4x + 4$ at $(1, 9)$.
A. $y = 9x$ B. $y = 6x - 15$ C. $y = 6x + 3$ D. $y = 2x + 1$
E. None of the above
- If $f(3) = 2$, $f'(3) = 4$, $g(3) = 5$, and $g'(3) = 6$, then the derivative of $\frac{f(x)}{g(x)}$ at $x = 3$ is
 $\left(\frac{f}{g}\right)'(3) =$
A. 0.32 B. $2/3$ C. $-8/25$ D. 0 E. Undefined

Regular problems: show all your work

8. Sketch the graphs of:

- (a) $(x - 3)^2$
- (b) $3 \cos x + 2$
- (c) $-\sin\left(x - \frac{\pi}{2}\right)$
- (d) e^{-x-1}

9. Find a formula for the function whose graph is obtained from the graph of $f(x) = e^x - 1$ by

- (a) Reflecting about the y -axis.
- (b) Vertically compressing by a factor of 5 and then shifting 3 units to the left.
- (c) Reflecting about the x -axis and then shifting 2 units down.

10. Let $f(x) = 2 - x$, $g(x) = \frac{1}{x}$, $h(x) = \sqrt{x+1}$. Find the following functions and state their domains:

- (a) $g \circ f$
- (b) $f \circ h$
- (c) $g \circ h$

11. Evaluate the limits:

- (a) $\lim_{x \rightarrow 5} (7x - 25)$
- (b) $\lim_{x \rightarrow -1} \frac{x^3 + x^2}{x^2 + 3x + 2}$
- (c) $\lim_{x \rightarrow 0} \frac{3 - \sqrt{9+x}}{x}$
- (d) $\lim_{x \rightarrow 2^+} \frac{x^3 - 2}{x^2 - x - 2}$
- (e) $\lim_{x \rightarrow 2^-} \frac{x^3 - 2}{x^2 - x - 2}$
- (f) $\lim_{x \rightarrow 2} \frac{x^3 - 2}{x^2 - x - 2}$
- (g) $\lim_{x \rightarrow 0} x^4 \cos\left(\frac{1}{x}\right)$

12. Find c such that the function $f(x) = \begin{cases} cx & \text{if } x \geq 2 \\ 5 - x & \text{if } x < 2 \end{cases}$ is continuous everywhere.

13. Show that the equation $x^5 - 4x + 2 = 0$ has at least one solution in the interval $(1, 2)$.

14. Find the vertical asymptotes of $f(x) = \frac{(x+2)(3x-4)}{(x-5)(x+7)}$.

15. Differentiate the following functions:

(a) $f(x) = 7x - 3$

(b) $p(s) = s^5 - 2s^4 + 3s^3 - 4s^2 + 5s - 6$

(c) $f(t) = \frac{3t^2 - 5t + 1}{\sqrt{t}}$

(d) $g(x) = x^2 - \frac{x^3}{\sqrt[4]{x}} + \frac{3}{x}$

(e) $q(y) = \frac{y^2 + y + 1}{y + 1}$