

Practice test 2

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

- How many vertical asymptotes does the curve $y = \frac{x+1}{x(x+2)(x+3)}$ have?
A. 0 B. 1 C. 2 D. 3 E. 4
- $\lim_{x \rightarrow 2} \frac{5}{x-2} =$
A. 0 B. 5 C. ∞ D. $-\infty$ E. Does not exist
- $\lim_{x \rightarrow -\infty} \frac{x+2}{3x+4} =$
A. 1 B. $\frac{1}{2}$ C. $\frac{1}{3}$ D. 0 E. Does not exist
- Find the rate of change of $y = 3x + 5$ at $x = 4$.
A. 3 B. 4 C. 5 D. 17
E. None of the above
- Find the derivative of $\sqrt{2x}$.
A. $\frac{2}{\sqrt{x}}$ B. $\frac{2}{\sqrt{2x}}$ C. $\frac{1}{2\sqrt{x}}$ D. $\frac{1}{\sqrt{2x}}$ E. $\frac{1}{2\sqrt{2x}}$
- Simplify the expression: $\frac{8x^3\sqrt{x}}{(3x^2)^2 + 7x^4}$
A. $\frac{8\sqrt{x}}{10x^2}$ B. $\frac{\sqrt{x}}{2}$ C. $\frac{1}{2\sqrt{x}}$ D. $\frac{4}{5\sqrt{x}}$ E. $4\sqrt{x}$
- The position of an object at time t is given by $s(t) = 4\sin(t) + 2\cos(t)$. Find the velocity of this object at $t = \frac{\pi}{3}$.
A. $1 + \sqrt{3}$ B. $1 + 2\sqrt{3}$ C. $1 - 2\sqrt{3}$ D. $2 + \sqrt{3}$ E. $2 - \sqrt{3}$

8. 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

9. 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

10. Evaluate the limits:

- (a) $\lim_{x \rightarrow 2^+} \frac{x^3 - 2}{x^2 - x - 2}$
 (b) $\lim_{x \rightarrow 2^-} \frac{x^3 - 2}{x^2 - x - 2}$
 (c) $\lim_{x \rightarrow 2} \frac{x^3 - 2}{x^2 - x - 2}$
 (d) $\lim_{x \rightarrow \infty} \frac{5x^3 - x - 3}{4x^3 + 3x^2 - 3}$
 (e) $\lim_{x \rightarrow -\infty} \frac{5x^2 - x - 3}{4x^3 + 3x^2 - 3}$
 (f) $\lim_{x \rightarrow \infty} \frac{5x^3 - x - 3}{4x^2 + 3x - 3}$
 (g) $\lim_{x \rightarrow \infty} \frac{\sqrt{4x^2 + 5}}{3x - 3}$
 (h) $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^2 + 5}}{3x - 3}$
 (i) $\lim_{x \rightarrow \infty} (3 - x + 2x^2 - 5x^3)$
 (j) $\lim_{x \rightarrow -\infty} (3 - x + 2x^2 - 5x^3)$

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

12. Differentiate the following functions:

- (a) $f(x) = 5$
 (b) $f(x) = 7x - 3$

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

(d) $f(t) = \sqrt{t}$

(e) $f(x) = \frac{2}{x}$

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

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

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

(i) $y = 3 \sin(x^5) + \frac{\pi}{2}$

(j) $f(x) = \cos(4)(x^3 - 3x)$

(k) $g(x) = \frac{x^3 - 5}{\cos(-x)}$

(l) $h(x) = \tan(x) \left(\frac{1}{\sqrt[4]{x^3}} + \frac{2}{x} \right)$

13. Find the points where the tangent line to the graph of $f(x) = x^5 - 80x$ is horizontal.

14. Find an equation of the tangent line to $y = \sqrt{2x + 3}$ at $(3, 3)$.