

Math 150 Practice Test 3

1. Find the intervals of increase and decrease for $f(x) = \frac{x^3 - 2}{x}$.
2. Find and classify the relative extrema of $f(x) = \frac{x}{2} - \sin x$.
3. Graph, including all relative extrema and inflection points:
 $f(x) = 2x^3 - 6x + 4$.
5. Find the dimensions of the rectangle with perimeter 12 and maximum area.
6. Evaluate:

a. $\lim_{x \rightarrow \infty} \frac{e^x}{(x+1)^2}$

b. $\lim_{x \rightarrow \frac{1}{2}} \frac{2x - \sin \pi x}{4x^2 - 1}$

c. $\lim_{x \rightarrow \frac{\pi}{2}} (\tan x)(\cos 3x)$

d. $\lim_{x \rightarrow 1^+} (x-1)^{\ln x}$

7. Evaluate:

a. $\int \left(\frac{4}{x^3} - 2e^x + \pi \right) dx$

b. $\int \left(\sqrt[5]{x^4} - \frac{2}{x} \right) dx$

c. $\int \left(\frac{4\sqrt{t} - t\sqrt{t}}{t^2} \right) dt$

d. $\int \sqrt[3]{t} \left(4t^2 - 3t + \frac{5}{t} \right) dt$

8. a. Use a left endpoint approximation with $n = 4$ rectangles to approximate the area under the graph of $f(x) = 2x^2$ from $x = 1$ to $x = 3$.

b. Use a midpoint approximation with $n = 4$ rectangles to approximate the area under the graph of $f(x) = 2x^2$ from $x = 1$ to $x = 3$.

9. a. Evaluate: $\sum_{k=1}^6 \sin\left(\frac{k\pi}{2}\right)$

b. Evaluate: $\sum_{k=0}^5 (-1)^k 2^k$

10. Evaluate: $\frac{d}{dx} \left[\int_1^x \sin^4 2t dt \right]$.

11. Find $f(x)$ if $f'(x) = 3x^3 + 2$ and $f(1) = 4$.

12. Evaluate:

a. $\int_4^9 \frac{1 - \sqrt{x}}{\sqrt{x}} dx$

b. $\int_{-1}^1 (x+1)^2 dx$

c. $\int_0^{\frac{\pi}{3}} 2 \sec^2 x dx$

d. $\int_0^{\ln 2} (e^x + 1) dx$