

REVIEW FOR FINAL EXAM
MATH 1830, FALL 05

FINAL EXAM: MONDAY, DECEMBER 12, 2005, 10:30-12:30 pm, 351 DUNN HALL

The final exam is cumulative and will cover the following sections:
1.1 through 1.6, 2.1 through 2.9, 3.1 through 3.4, 4.1, 4.2 and 5.1 through 5.6.

It is a closed book, paper and pencil exam. **You need to bring your ID to the exam.**
You can bring a sheet of notes, written on both sides to the exam.

REVIEW PROBLEMS

Problem 1: Write the equation of the line that passes through the point $(1, 2)$ and whose x -intercept is 3.

Problem 2: Find the domain of each of the following functions:

1. $f(x) = \frac{3x}{\sqrt{x-4}}$

2. $f(x) = \sqrt{x^2 - 16}$

3. $f(x) = \frac{4x}{x^2 - 5x + 4}$

4. $f(x) = \sqrt{x^6 + 3x^2 + 7}$.

Problem 3: Consider a function $y = f(x)$ defined by

$$f(x) = \begin{cases} x^2 + 2x + 1 & \text{if } x \leq 2 \\ -x^4 + \frac{1}{x} & \text{if } x > 2. \end{cases}$$

1. Compute the following limits:

(a) $\lim_{x \rightarrow 2^-} f(x)$

(b) $\lim_{x \rightarrow 2^+} f(x)$

(c) $\lim_{x \rightarrow 3} f(x)$.

2. Is the function $y = f(x)$ continuous at $x = 2$? Justify your answer.

Problem 4: Find the equation of the tangent line to the graph of $y = x^2 - 3\sqrt{x} + 7$ at $x = 4$ and then compute its x -intercept.

Problem 5: Compute the following derivatives

1. $\frac{d}{dx} ((x^2 + 3)\sqrt{x + 7})$

2. $\frac{d}{dx} \left(\frac{3x+4}{x^3-6x+8} \right)$

3. $\frac{d}{dx} ((x^4 - 7x + 3)^{15})$

4. $\frac{d}{dx} \left(e^{\sqrt{3x-1}} \right)$

5. $\frac{d}{dx} (\ln(2x^5 + \sqrt{3x} + 7))$

6. $\frac{d}{dx} \left(\frac{\ln x}{\sqrt{x}} \right)$

Problem 6: Determine the absolute max/min values (if they exist) of each of the following functions over the indicated intervals

1. $f(x) = x^4 - 2x^2, \quad (-\infty, 0).$

2. $f(x) = 12 + 9x - 3x^2 - x^3, \quad [-3, 2].$

Problem 7: For each of the following functions determine all vertical, horizontal and oblique asymptotes (if any). Also, compute both the limit from the left and the limit from the right of the function $f(x)$ (in both cases) at the point where vertical asymptotes occur.

(a) $f(x) = 3x - 1 + \frac{1}{x-2}$

(b) $f(x) = 5 + \frac{1}{x+3}.$

Problem 8: Find a function $f(x)$ defined for all $x > 0$ such that $f'(x) = x^3 \ln x$ and $f(1) = 3$.

Problem 9: Find the area between the graphs of the functions $y = \frac{x^2}{3}$ and $y = 2x$.

Problem 10: Compute the following integrals:

1. $\int e^x \sqrt{e^x - 1} dx$

2. $\int x \sqrt{x} dx$

3. $\int \frac{1}{x} (3 + \ln x)^4 dx$

4. $\int \ln(x + 7) dx$

5. $\int (2x - 5)e^{x^2 - 5x + 8} dx$

6. $\int x^{-4} \ln(x) dx$