



PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam

MATHEMATICS I

28-1-2006

Part 1. Each problem is 2.5 marks. Circle the best choice.

1. Evaluate $\lim_{x \rightarrow 2} \left(\frac{1/x - 1/2}{x - 2} \right)$

- (a) $\frac{-1}{4}$ (b) 1 (c) ∞ (d) 0

2. Find the area under $y = x^2 + 2x + 5$ on the interval $[0, 3]$

- (a) 16 (b) 20 (c) 27 (d) 33

3. Find the domain of $y = \sqrt{\frac{x^2 - 1}{x^2 - 3x}}$

- (a) $(-\infty, -1] \cup (0, 1] \cup (3, \infty)$ (b) $(-\infty, -1) \cup [0, 1) \cup [3, \infty)$
(c) $(-\infty, -1] \cup [0, 3) \cup (3, \infty)$ (d) $(-\infty, 0) \cup (0, 3) \cup (3, \infty)$

4. Find the derivative of $y = (\cos 5x)(\sin x^2)$

- (a) $-(\sin 5x)(\sin x^2) + (\cos 5x)(\cos x^2)$
(b) $(\cos 5x)(\cos 2x) + (-\sin 5x)(\sin x^2)$
(c) $-5(\sin 5x)(\sin x^2) + (\cos 5x)(2x \cos x^2)$
(d) $(\cos 5x)(2 \sin x) + (-5 \sin x)(\sin x^2)$

5. Evaluate $\int \frac{dx}{\sqrt{1 - 9x^2}}$

- (a) $\frac{1}{9} \sin^{-1} 9x$ (b) $\frac{1}{3} \sin^{-1} 3x$ (c) $\frac{1}{3x} \sin^{-1} 3x$ (d) $\frac{1}{9} \sin^{-1} x$

6. Evaluate $\lim_{x \rightarrow \infty} \left(\frac{\sqrt{x^3}}{x^2 + x + 1} \right)$

- (a) $\frac{3}{8}$ (b) 1 (c) ∞ (d) 0



7. Find the inverse of $y = 2x - 3$

(a) $y = -2x + 3$ (b) $y = -\frac{1}{2}x - \frac{3}{2}$ (c) $y = 3x - 2$ (d) $y = \frac{1}{2}x + \frac{3}{2}$

8. Find an interval such that $y = x^3 - 2x^2 + x + 7$ concaves up

(a) $\left(-\infty, \frac{1}{3}\right)$ (b) $\left(0, \frac{2}{3}\right)$ (c) $\left(\frac{1}{3}, 1\right)$ (d) $\left(\frac{2}{3}, \infty\right)$

9. Find the derivative of $y = \tan^{-1}\sqrt{x^3}$

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

10. Find $f(g(x))$ for $f(x) = \frac{x^2-1}{x}$ and $g(x) = 3x-1$

(a) $\frac{9x^2-6x}{3x-1}$ (b) $9x-6$ (c) $\frac{3x^2-x-1}{x}$ (d) $\frac{3x^3-x^2-3x+1}{x}$

Part 2. Each problem is 5 marks.

1. For the function $y = 4x^2 - 16x + 7$

- Find the maximum or minimum point
- Find the intersections with x-axis and y-axis
- Draw the graph

2. Find the absolute maximum and absolute minimum points of $y = 2x^3 - 3x^2 - 12x + 10$ on the interval $[-3, 3]$

3. Find the derivative and the equation of the tangent line at $(3, 1)$ for the function $x^2y + 2y^3 = 3x + 2y$

4. Evaluate $\int \frac{x dx}{\sqrt{1-4x^2}}$ using substitution.

5. Find the area contained between the graphs $y = x$ and $y = 6 - x^2$

THE END