

Prob | Pts

Math 121

Calculus II

Spring 2006

Final Exam
Instructor: _____

Name: (print neatly) _____
(sign) _____

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1. (**24 pts.**) Evaluate the following derivatives.

a) $\frac{d}{dx} e^{1-x^2} =$

b) $\frac{d}{dx} (\ln(x\sqrt{e^x}) + \ln(x\sqrt{e})) =$

Total

$$\text{c) } \frac{d}{dx} x^{3x} =$$

$$\text{d) } \frac{d}{dx} \arctan(x^2) =$$

2. (40 pts.) Compute the following integrals.

a) $\int_0^2 (5x^3 - 3x^2 + 1) dx$

b) $\int \sin(3x)\sqrt{1 - \cos(3x)} dx$

c) $\int \frac{x+1}{e^x} dx$

d) $\int \ln(x^3 - x) dx$

$$e) \int \pi^x dx$$

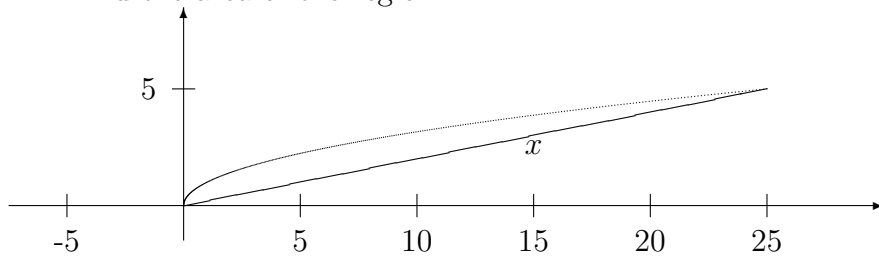
$$f) \int \frac{1+x}{1+x^2} dx$$

3. (8 pts.) Suppose $f'(x) = xe^x$ for all x and $f(-1) = 2$. Find $f(+1)$.

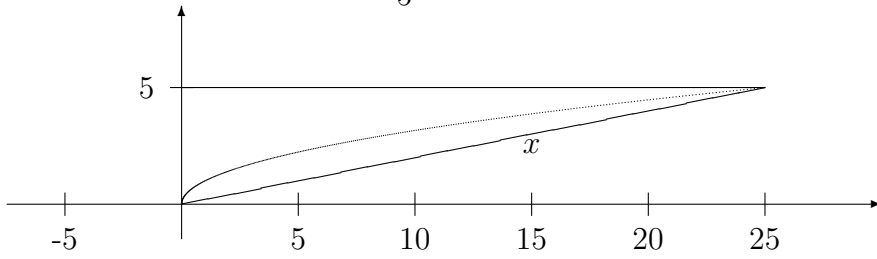
4. (4 pts.) Find the average value of $f(x) = \frac{1}{1+x^2}$ on the interval $[-\sqrt{3}, \sqrt{3}]$.

5. (12 pts.) Find the area between the curves $y = \sqrt{x}$ and $y = \frac{x}{5}$.

Find the area of the region



6. (12 pts.) Find the volume of the solid obtained by rotating the region between the curves $y = \sqrt{x}$ and $y = \frac{x}{5}$ about the axis $y = 5$.



7. (5 pts.) Compute $\int_0^2 3f'(x) - f''(x) dx$ via the Fundamental Theorem of Calculus, given that $f(0) = 3$, $f'(0) = 0$, $f''(0) = -1$, $f(1) = 6$, $f'(1) = -1$, $f''(1) = -1$, $f(2) = 9$, $f'(2) = 2$, and $f''(2) = 0$.

8. (5 pts.) Show that $\int_0^\pi (e^2 + \sin(e^x)) dx > 9$

9. (10 pts.) Use integration by parts to evaluate the following.

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

b) $\int (x^3 - x + 1) \ln(x + 1) dx$.