

213 Final Exam Review Part 1

December 8, 2013

1. Compute the derivatives of the following functions:

- (a) $f(x) = x^2 e^x$;
- (b) $f(x) = e \ln(2)$;
- (c) $f(x) = \frac{x^2 + 2x + 3}{x^3 + 1}$;
- (d) $f(x) = e^{x^2 + 4x + 1}$;
- (e) $f(x) = \frac{2x e^{x^3}}{x^3 + 1}$;
- (f) $f(x) = e^{e^x}$;
- (g) $f(x) = \ln(x^2 + e^{x+1})$.

2. Compute $f'(0)$ for all of the above functions.

3. Graph the following functions by finding, and classifying, critical points, finding inflection points, and computing horizontal asymptotes:

- (a) $x^3 - 3x + 1$
- (b) $x e^x$;

4. Find the maximum area of a rectangle which is circumscribed in a circle of radius 1.

5. Compute the following indefinite integrals:

- (a) $\int (x^2 + 3x + 1) dx$;
- (b) $\int \frac{x}{x+1} dx$;
- (c) $\int \frac{2x}{x^2+1} dx$;
- (d) $\int x^2 \ln(x) dx$;
- (e) $\int x^3 \sqrt{x^2 + 1} dx$;
- (f) $\int e^x (x + 1) dx$;
- (g) $\int (\ln(x) - \frac{1}{x^2 + 2x + 1}) dx$.

6. Evaluate all of the above integrals between 1 and 3.

7. Estimate the following integrals using both Simpson's Rule and the Trapezoid Rule for $n = 2$ and $n = 4$:

- (a) $\int_0^2 e^{-x^2} dx$;
- (b) $\int_1^3 \frac{dx}{x^2+1}$;
- (c) $\int_{-1}^1 \frac{x+1}{\ln(x^2+2)}$.