

MAT1320A

Practice sheet for the second midterm

These are supplementary exercises. If you don't know how to solve them, go back to the appropriate section of the textbook and work through the examples in that section, then move on to the suggested exercises in the textbook (which have solutions at the back of the book). After that, work on these.

1. Implicit and logarithms differentiation. (See Chapter 3.5 and 3.6). Differentiate the following:

1. $x^2 - 4xy + y^2 = 4$

3. $x \cdot e^y = x - y$

5. $y = x^{xe^x}$

2. $x^y + y = x$

4. $y = (\ln(x))^{\sin(x)}$

6. $y = (\arctan(x))^x$

2. Related Rates. The following from Chapter 3.9: 3–7, 9–11, 37–40.

3. Chapter 3.10. Find the linearization L of each function f at the given point a , then use this to give a linear approximation of the given number u .

1. $f(x) = \sqrt[5]{x}$, $a = 32$, $u = \sqrt[5]{30}$

3. $f(x) = (x + 3)^3$, $a = 0$, $u = 3.01^3$

2. $f(x) = \ln(x)$, $a = 1$, $u = \ln(0.9)$

4. $f(x) = x^x$, $a = 1$, $u = (0.9)^{0.9}$

4. Chapter 5.1. Riemann Sums. Set up right Riemann Sums R_n to estimate each of the following integrals with n intervals (that is, find a formula for Δx , and for the end points x_i for $i = 0, 1, \dots, n$, and then write out the sum using summation (sigma) notation) — but do not try to evaluate.

1. $\int_1^3 \frac{2x}{2x^2 + 1} dx$

3. $\int_2^5 e^{5x} dx$

2. $\int_{-\pi/2}^{\pi/2} \sqrt{\cos(x)} dx$

4. $\int_0^{\pi/6} \tan(4x) dx$

5. Chapter 5.2 : the integral. Use the given information to evaluate the integral.

1. f is an even function and $\int_0^4 f(x) dx = 3$. Find $\int_{-4}^4 f(x) dx$.

2. f is an odd function. Find $\int_{-4}^4 (f(x) + 5) dx$.
3. $\int_{-4}^0 f(x) dx = -3$ and $\int_0^4 f(x) dx = -12$. Find $\int_{-4}^4 f(x) dx$.
4. $\int_{-4}^4 f(x) dx = 243$, $\int_{-4}^6 f(x) dx = 99$, $\int_{-4}^2 f(x) dx = 1$. Find $\int_2^4 f(x) dx$ and $\int_4^6 f(x) dx$.
5. $\int_{-4}^4 f(x) dx = -2$, $\int_{-4}^4 g(x) dx = 7$. Find $\int_{-4}^4 (5f(x) - 2g(x) + 3) dx$.

6. Chapter 5.3 : FTC1. Find the derivative of each of the following functions:

1. $\int_0^{3x} \frac{u^2 - 1}{u^2 + 1} du$
3. $\int_3^{\sqrt{x}} \frac{t^2 + 1}{2t^4 + 5t^2 + 1} dt$
5. $\int_0^{x^2} \sin(t^3 + 1) dt$
2. $\int_1^{x^2} e^{t^2} dt$
4. $\int_{\sqrt{x}}^{2x} \arctan(t) dt$

7. Chapters 4.9, 5.5, 7.1, 7.2 and 7.3. Compute the following integrals:

1. $\int_1^9 \sqrt{x} dx$
7. $\int \frac{\sin(2x)}{1 + \cos^2(x)} dx$
2. $\int \frac{1+x}{1+x^2} dx$
8. $\int \sec^2(\theta) \cdot \tan^3(\theta) d\theta$
3. $\int \frac{z^2}{z^3 + 1} dz$
9. $\int \frac{e^u}{(1 - e^u)^2} du$
4. $\int \frac{x}{1+x^4} dx$
10. $\int \frac{\sin(x)}{1 + \cos^2(x)} dx$
5. $\int (x-1)e^{(x-1)^2} dx$
11. $\int_0^{\pi/6} \frac{\sin(t)}{\cos^2(t)} dt$
6. $\int x^2 \sqrt{2+x} dx$
12. $\int \cos^3(\theta) \sin(\theta) d\theta$

$$13. \int 5^t \cdot \sin(5^t) dt$$

$$14. \int \cos(1 + 5t) dt$$

$$15. \int_e^{e^4} \frac{dx}{x \cdot \sqrt{\ln(x)}}$$

$$16. \int_0^1 \frac{dx}{(1 + \sqrt{x})^4}$$

$$17. \int_0^1 x e^{-x^2} dx$$

$$18. \int x^2 e^{-x} dx$$

$$19. \int (\ln(x))^2 dx$$

$$20. \int t^4 \ln(t) dt$$

$$21. \int \ln(\sqrt{x}) dx$$

$$22. \int_0^{2\pi} x^2 \sin(x) dx$$

$$23. \int_1^5 \frac{M}{e^M} dM$$

$$24. \int_1^2 x^4 (\ln(x))^2 dx$$

$$25. \int e^{\cos(t)} \sin(2t) dt$$

$$26. \int x \cdot \ln(1 + x) dx$$

$$27. \int_e^{e^2} \frac{5(\ln(x))^{1/5}}{x} dx$$

$$28. \int \sqrt{9 - 4x^2} dx$$

$$29. \int (4 + r^2)^{-2} dr$$

$$30. \int \frac{x}{\sqrt{2x^2 - 1}} dx$$

$$31. \int_0^4 2^s ds$$

$$32. \int_{1/\sqrt{3}}^{\sqrt{3}} \frac{8}{1 + x^2} dx$$

8. Given the clues, find f .

$$1. f''(x) = \sin(2x), f(0) = 1, f'(0) = 4$$

$$2. f''(x) = \sqrt{3x}, f(0) = 0, f(3) = 4$$

$$3. f'(x) = x^e + e^x, f(0) = 7$$

$$4. f'(x) = \sqrt{\frac{3}{x}}, f(3) = 6$$

$$5. f'(x) = x \cos(5x), f(0) = 17.$$

$$6. f''(x) = x^{-2/3}, f(1) = 1, f'(1) = 0.$$