

AP CALCULUS AB

HOMEWORK #12

7.2. Trigonometric Substitutions

Supplemental Problems

1, 2

7.3. Polynomials times Functions whose Derivatives Repeat

Supplemental Problems

3, 4, 5

7.4. Exponential Growth and Decay

Section 7.4 Exercises, pg. 364

24, 35¹

7.4. Newton's Law of Cooling (or Heating)

Supplemental Problems

6

Section 7.4 Exercises, pg. 364

30, 31

9.2. L'Hôpital's Rule

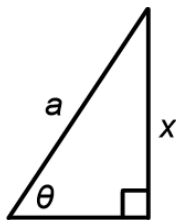
Section 9.2 Exercises, pg. 458

2², 3², 7, 15², 19, 21³, 24³**Notes:**

1. For Carbon-14 (C-14) $k = 0.000\ 120\ 968/\text{yr}$.
2. No need to estimate the limits graphically.
3. Use the natural logarithm.

Supplemental Problems:

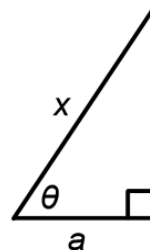
- 1) Use the triangle



to construct a trigonometric substitution in order to evaluate the indefinite integral

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

- 2) Use the triangle



to construct a trigonometric substitution in order to evaluate the indefinite integral

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

Recall that

$$\int \sec \theta \, d\theta = \ln |\sec \theta + \tan \theta| + k.$$

- 3) Evaluate

$$\int x^2 e^x \, dx = \int f'(x) \, dx = f(x) + k$$

by assuming a function of the form

$$f(x) = Ax^2 e^x + Bx e^x + C e^x,$$

differentiating it, and then choosing the values of the constants A , B and C accordingly.

- 4) Evaluate

$$\int x^2 \sin x \, dx = \int f'(x) \, dx = f(x) + k$$

by assuming a function of the form

$$f(x) = Ax^2 \sin x + Bx^2 \cos x + Cx \sin x + Dx \cos x + E \sin x + F \cos x,$$

differentiating it, and then choosing the values of the constants A , B , C , D , E and F accordingly.

- 5) Calculate $\frac{d^{369}f}{dx^{369}}$ for

a) $f(x) = e^{-x}$

b) $f(x) = \sinh x$

c) $f(x) = \cos x$

6) Solve

$$\frac{dy}{dx} = 3 - 2y$$

for $y = y(x)$ subject to the initial condition $y(0) = 5$.