

Questions on 7.4 and 7.5 Bookwork HW? I will check ALL your homework today. :) Our test is Wednesday because we have Monday off.

AP CALCULUS AB
Unit 7 Review
Differential Equations and Mathematical Modeling

No calculator may be used on the following problems.

1. $\int_{-1}^1 \frac{4}{1+x^2} dx =$

(A) 0 (B) π (C) 1 (D) 2π (E) 2

2. $\int x\sqrt{5x^2-4} dx =$

(A) $\frac{1}{10}(5x^2-4)^{\frac{3}{2}} + C$

(B) $\frac{1}{15}(5x^2-4)^{\frac{3}{2}} + C$

(C) $-\frac{1}{5}(5x^2-4)^{\frac{1}{2}} + C$

(D) $\frac{20}{3}(5x^2-4)^{\frac{3}{2}} + C$

(E) $\frac{3}{20}(5x^2-4)^{\frac{3}{2}} + C$

3. The average value of the function $f(x) = (x-1)^2$ on the interval from $x = 1$ to $x = 5$ is

(A) $-\frac{16}{3}$ (B) $\frac{16}{3}$ (C) $\frac{64}{3}$ (D) $\frac{66}{3}$ (E) $\frac{256}{3}$

4. If $\frac{dy}{dx} = \frac{(3x^2 + 2)}{y}$ and $y = 4$ when $x = 2$, then when $x = 3$, $y =$

(A) 18

(B) $\sqrt{66}$

(C) 58

(D) $\sqrt{74}$

(E) $\sqrt{58}$

5. $\int \frac{dx}{9+x^2} =$

(A) $3 \tan^{-1}\left(\frac{x}{3}\right) + C$

(B) $\frac{1}{3} \tan^{-1}\left(\frac{x}{3}\right) + C$

(C) $\frac{1}{9} \tan^{-1}\left(\frac{x}{3}\right) + C$

(D) $\frac{1}{3} \tan^{-1}(x) + C$

(E) $\frac{1}{9} \tan^{-1}(x) + C$

6. $\int_0^{\frac{1}{2}} \frac{2}{\sqrt{1-x^2}} dx =$

(A) $\frac{\pi}{6}$

(B) $\frac{\pi}{3}$

(C) $-\frac{\pi}{3}$

(D) $\frac{2\pi}{3}$

(E) $-\frac{2\pi}{3}$

7. $\int x\sqrt{x+3} dx = \int (u-3)(u-3+3)^{1/2} du = \int (u-3)(u^{1/2}) du$

(A) $\frac{2}{3}(x)^{3/2} + 6(x)^{1/2} + C$

(B) $\frac{2(x+3)^{3/2}}{3} + C$

(C) $\frac{2}{5}(x+3)^{5/2} - 2(x+3)^{3/2} + C$

(D) $\frac{3(x+3)^{3/2}}{2} + C$

(E) $\frac{4x^2(x+3)^{3/2}}{3} + C$

$u = x+3 \rightarrow u-3 = x$
 $du = dx$

$= \int (u^{3/2} - 3u^{1/2}) du$
 $= \frac{2}{5}u^{5/2} - \frac{2 \cdot 3}{2}u^{3/2} + C$
 $= \frac{2}{5}(x+3)^{5/2} - 2(x+3)^{3/2} + C$

A graphing calculator may be used on the following problems.

8. $\int_0^{\pi} \sin x dx + \int_{-\pi/4}^0 \cos x dx =$

- (A) $-\sqrt{2}$ (B) -1 (C) 0 (D) 1 (E) $\sqrt{2}$

9. $\int \tan^6 x \sec^2 x dx =$

- (A) $\frac{\tan^7 x}{7} + C$
- (B) $\frac{\tan^7 x}{7} + \frac{\sec^3 x}{3} + C$
- (C) $\frac{\tan^7 x \sec^3 x}{21} + C$
- (D) $7 \tan^7 x + C$
- (E) $\frac{2}{7} \tan^7 x \sec x + C$

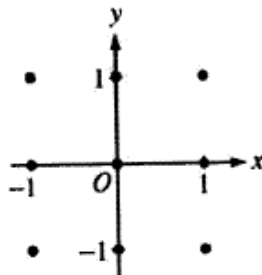
10. $\int \frac{\ln x}{3x} dx =$

- (A) $6\ln^2|x| + C$
 (B) $\frac{1}{6}\ln(\ln|x|) + C$
 (C) $\frac{1}{3}\ln^2|x| + C$
 (D) $\frac{1}{6}\ln^2|x| + C$
 (E) $\frac{1}{3}\ln|x| + C$

No calculator may be used on the following problem.

11. Consider the differential equation $\frac{dy}{dx} = (y - 1)^2 \cos(\pi x)$.

- (a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.
 (Note: Use the axes provided in the exam booklet.)



- (b) There is a horizontal line with equation $y = c$ that satisfies this differential equation. Find the value of c .
 (c) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(1) = 0$.

Homework

Unit 7 Review