

BC Calculus '18-19
Integration Techniques Test

name _____

Score _____

1. $\int \frac{3x-5}{x^2-7x-18} dx =$

a) $\ln \left| \frac{x+2}{(x-9)^2} \right| + C$

b) $\ln \left| \frac{(x-9)^2}{x+2} \right| + C$

c) $\ln |(x-9)(x+2)^2| + C$

d) $\ln |(x-9)^2(x+2)| + C$

e) $\frac{1}{2} \ln \left| \frac{x-9}{x+2} \right| + C$

2. $\int (x^3)\sqrt{1-x^2} dx$

a) $\frac{x^4}{2} \cdot \frac{(1-x^2)^{3/2}}{3} + C$

b) $\frac{1}{2}(1-x^2)^{1/2} + \frac{1}{3}(1-x^2)^{3/2} + C$

c) $-\frac{1}{3}(1-x^2)^{3/2} - \frac{1}{5}(1-x^2)^{5/2} + C$

d) $\frac{1}{3}(1-x^2)^{3/2} + \frac{1}{5}(1-x^2)^{5/2} + C$

e) $\frac{1}{3}(1-x^2)^{3/2} + C$

3. For $\int \csc^3 x \cot^5 x \, dx$, the correct u-substitution is

- a) $u = \csc x$
 - b) $u = \cot x$
 - c) either $u = \csc x$ or $u = \cot x$
 - d) neither $u = \csc x$ nor $u = \cot x$
 - e) convert to sine and cosine
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4. $\int x^3 \ln x \, dx =$

- a) $\frac{x^4}{4}(4 \ln x - 1) + c$
 - b) $\frac{x^4}{16}(4 \ln x - 1) + c$
 - c) $\frac{x^2}{4}(\ln x - 1) + c$
 - d) $3x^2 \left(\ln x - \frac{1}{2} \right) + c$
 - e) $x^2(3 \ln x + 1) + c$
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5. What is the best method to evaluate $\int \frac{dx}{x(4x^2-9)}$?

- a) Integration by Parts b) Substitution c) Partial Fractions
d) Completing the Square e) Formula
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6. The population $P(t)$ of a species satisfies the logistic differential equation $\frac{dP}{dt} = \frac{1}{4000}P(400-P)$, where $P(0) = 100$. What is the end behavior of $P(t)$?

- a) 10
b) 100
c) 200
d) 400
e) 4000
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7. Which of the following statements are true?

I. $\int \frac{1}{x\sqrt{16-x^2}} dx = \frac{1}{4} \sec^{-1} \frac{x}{4} + c$

II. $\int \cot x dx = \ln|\sin x| + c$

III. $\int \left(\frac{e^x}{\tan e^x} \right) dx = \ln|\sec e^x| + c$

- a) I only b) II only c) III only
d) I and II only e) I and III only f) I, II, and III
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8. $\int x^2 \sin x dx =$

- a) $-x^2 \cos x - 2x \sin x - 2 \cos x + c$
b) $-x^2 \cos x + 2x \sin x - 2 \cos x + c$
c) $-x^2 \cos x + 2x \sin x + 2 \cos x + c$
d) $-\frac{x^3}{3} \cos x + c$
e) $2x \cos x + c$
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9. $\int \frac{x^2 - 4}{x^2 + 4} dx =$

a) $\frac{1}{2} \tan^{-1} \frac{x}{2} + c$

b) $\ln|x^2 + 4| + c$

c) $\ln|x^2 + 4| + \frac{1}{2} \tan^{-1} \frac{x}{2} + c$

d) $x - 4 \tan^{-1} \frac{x}{2} + c$

e) $x - 8 \tan^{-1} \frac{x}{2} + c$

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1. $\int \frac{x^3 + x^2}{x^3 - 5x^2 - 4x + 20} dx$

2. Find the volume of a solid formed by cross-sections perpendicular to the x -axis where the base is the region bounded by $y=0$, $x=0$, $x=\frac{\pi}{2}$, and $y=2x\sqrt{\cos x}$, and where the cross-sections are rectangles where the height is half the base edge. Show the anti-differentiation.

3. $\int_{-\infty}^{-3} \frac{dx}{x^2 + 6x + 13}$