

1. Which of the following statements are true?

I. $\int (\csc u) dx = \ln|\cot u| + c$ II. $\int \cos^2 u du = \frac{1}{2}u + \frac{1}{4}\cos 2u + c$

III. $\int \left(\frac{1}{\sqrt{4-x^2}} \right) dx = \sin^{-1} \frac{x}{2} + c$

- a) I only b) II only c) III only d) I and III e) II and III only
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2. $\int \left(x^3 + 2 + \frac{1}{x^2 + 1} \right) dx =$

a) $\frac{x^4}{4} + 2x + \tan^{-1} x + C$

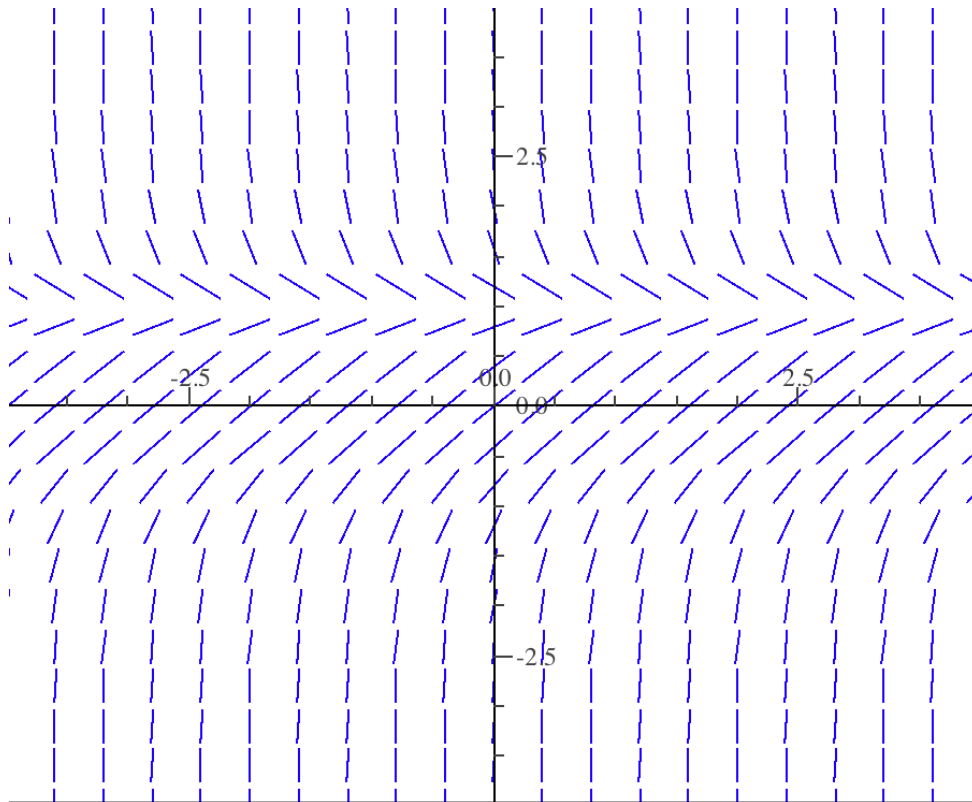
b) $x^4 + 2 + \tan^{-1} x + C$

c) $\frac{x^4}{4} + 2x + \frac{3}{x^3 + 3} + C$

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

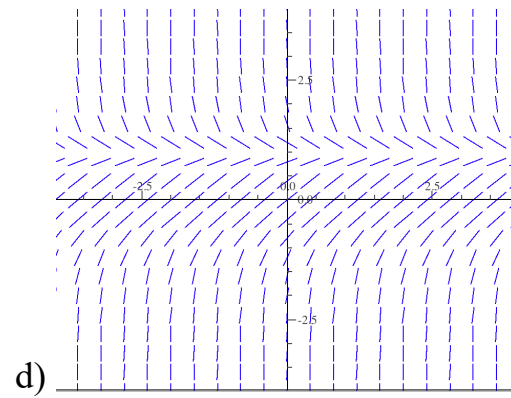
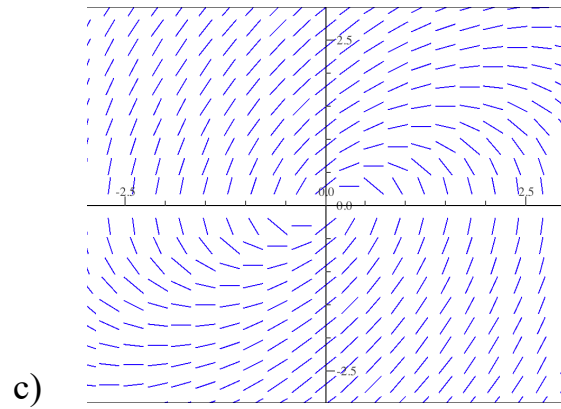
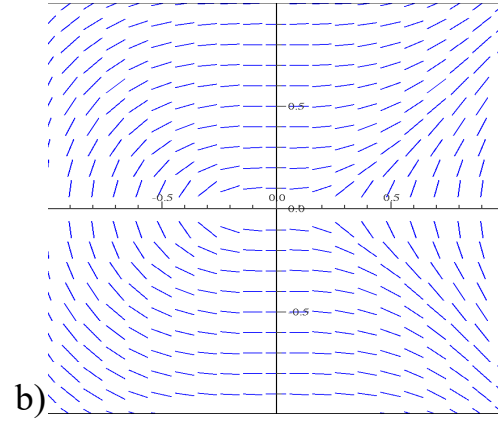
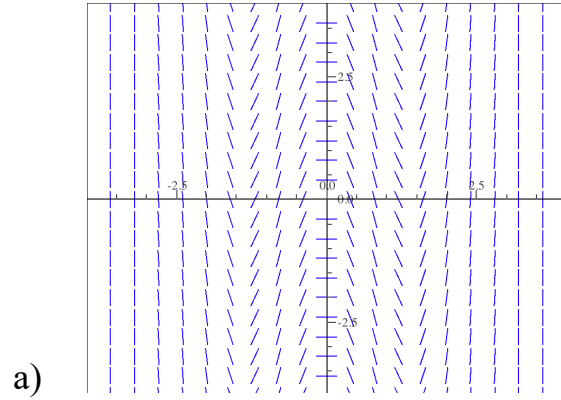
e) $4 + 2x + \tan^{-1} x + C$

3. Which of the following differential equations corresponds to the slope field shown in the figure below?



- a) $\frac{dy}{dx} = 1 - y^3$ b) $\frac{dy}{dx} = y^2 - 1$ c) $\frac{dy}{dx} = -\frac{x^2}{y^2}$
- d) $\frac{dy}{dx} = x^2 y$ e) $\frac{dy}{dx} = x + y$
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4. Which of the slope field shown below corresponds to $\frac{dy}{dx} = x^2 y$?



5. Which of the following is the solution to the differential equation

$$\frac{dy}{dx} = \frac{4x}{y} \text{ where } y(2) = -2?$$

- a) $y = 2x$
 - b) $y = 2x - 6$
 - c) $y = -\sqrt{4x^2 - 12}$
 - d) $y = \sqrt{4x^2 - 12}$
 - e) $y = -\sqrt{4x^2 - 6}$
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6. A particle moves along the y-axis so that at any time $t \geq 0$, its velocity is given $v(t) = \sin(2t)$. If the position of the particle at time $t = \frac{\pi}{2}$ is $y = 3$, the particle's position at time $t = 0$ is

- a) -4
 - b) 2
 - c) 3
 - d) 4
 - e) 6
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7. $\int x(x^2 - 1)^4 dx =$

a) $\frac{1}{10}x^2(x^2 - 1)^5 + C$ b) $\frac{1}{10}(x^2 - 1)^5 + C$ c) $\frac{1}{5}(x^3 - x)^5 + C$

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

8. For $\int \cos^3 x \sin x dx$, the correct u-substitution is

a) $u = \cos x$

b) $u = \sin x$

c) $u = x^3$

d) $u = \cos^3 x$

e) use the half-angle formulas

Identify is the first mistake (if any) in this process:

$$\int \sec^2 2x \tan^3 2x \, dx =$$

Step 1: $\frac{1}{2} \int \tan^3 2x \sec^2 2x 2dx =$

Step 2: $\frac{1}{2} \int u^3 \, du =$

Step 3: $\frac{1}{2} \left(\frac{1}{4} u^4 \right) =$

Step 4: $\frac{1}{8} \tan^4 2x$

a) Step 1

b) Step 2

c) Step 3

d) Step 4

e) There is no mistake.

AP Calculus AB '20-21
Anti-Derivative FRQ Test v1

Name _____

Score _____

1. $\int \left(x^4 + 8^x - \frac{1}{\sqrt[3]{x^7}} + \frac{1}{8x} \right) dx$

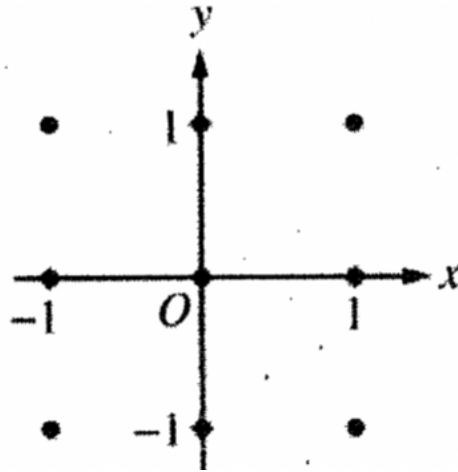
2. $\int \frac{3x^4}{(1+x^5)^7} dx$

3. A particle's acceleration is given by $a(t) = 6t + 12$ meters per second squared. At time $t = 1$, the particle's velocity is 4 meters per second and its position is 0 meters. Find the particle's position equation.

4. $\int (3x^6 - \sin(3x) + xe^{4x^2}) dx$

5. Given the differential equation, $\frac{dy}{dx} = \frac{3x^2}{y+2}$

a. On the axis system provided, sketch the slope field for the $\frac{dy}{dx}$ at all points plotted on the graph.



b. If the solution curve passes through the point $(0, 0)$, sketch the solution curve on the same set of axes as your slope field.

c. Find the particular solution to $\frac{dy}{dx} = \frac{3x^2}{y+2}$ with the initial condition $f(1) = 0$.