Student: Cole Lamers **Date:** 09/28/19	**Instructor:** Viktoriya Shcherban **Course:** Calc 1 11:30 AM / Internet (81749&81750) Shcherban	**Assignment:** 4.7 Antiderivatives (Set 2)

1. Find the most general antiderivative or indefinite integral. Check your answers by differentiation.

$$\int \left(\sin 8x - \sec^2 x \right) dx$$

$\int \left(\sin 8x - \sec^2 x \right) dx = \boxed{-\frac{1}{8}\cos 8x - \tan x + c}$ (Use C as the arbitrary constant.)

2. Find the most general antiderivative or indefinite integral. Check your answer by differentiation.

$$\int \frac{1 + \sin(6t)}{4}\, dt$$

$\int \frac{1 + \sin(6t)}{4}\, dt = \boxed{\frac{1}{4}t - \frac{1}{24}\cos 6t + c}$

(Use C as the arbitrary constant.)

3. Verify the formula by differentiation.

$$\int \sec^2(3x-2)dx = \frac{1}{3}\tan(3x-2) + C$$

Which function should be differentiated?

- **A.** $\frac{1}{3}\tan(3x-2) + C$
- **B.** $\sec^2(3x-2)$

Use the Chain Rule (using f(g(x))) to differentiate. Recall that differentiating a constant, such as C, results in 0. Therefore, C will not influence choosing appropriate definitions for f and g. Choose appropriate definitions for f and g below.

- **A.** $f(x) = 3x - 2$; $g(x) = \frac{1}{3}\tan(x)$
- **B.** $f(x) = \frac{1}{3}\tan(x-2)$; $g(x) = 3x$
- **C.** $f(x) = 3x$; $g(x) = \frac{1}{3}\tan(x-2)$
- **D.** $f(x) = \frac{1}{3}\tan(x)$; $g(x) = 3x - 2$

Find the derivatives of each of the functions involved in the Chain Rule.

$f'(x) = \frac{1}{3}\sec^2 x$ and $g'(x) = 3$

Which of the following is equal to $f'(g(x))$?

- **A.** $\tan(x)$
- **B.** $\sec^2 x$
- **C.** 1

Differentiate the compound function.

$$\frac{d}{dx}\left(\frac{1}{3}\tan(3x-2) + C\right) = \sec^2(3x-2)$$

4. Verify the formula by differentiation.

$$\int \frac{7}{(7x+2)^2}dx = -\frac{1}{7x+2} + C$$

Which function should be differentiated?

- **A.** $-\frac{1}{7x+2} + C$
- **B.** 7

Use the Quotient Rule (using $\frac{f(x)}{g(x)}$) to differentiate. Recall that differentiating a constant, such as C, results in 0. Therefore, C will not influence choosing appropriate definitions for f and g. Choose appropriate definitions for f and g below. Treat the negative sign in front of the fraction as if it is in the numerator.

- **A.** $f(x) = -7x;\ g(x) = 2$
- **B.** $f(x) = -1;\ g(x) = 7x + 2$
- **C.** $f(x) = 2;\ g(x) = -7x$
- **D.** $f(x) = 7x + 2;\ g(x) = -1$

Find the derivatives of each of the functions involved in the Quotient Rule.

$f'(x) =$ 0 and $g'(x) =$ 7

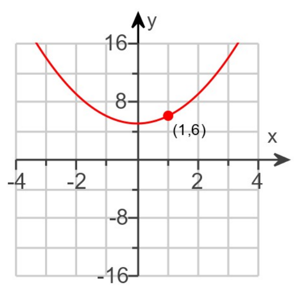
Apply the Quotient Rule to determine $\frac{d}{dx}\left(-\frac{1}{7x+2} + C\right)$.

$$\frac{d}{dx}\left(-\frac{1}{7x+2} + C\right) = \frac{7}{(7x+2)^2}$$

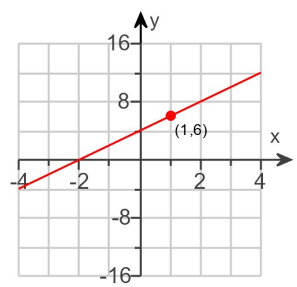
5. Graph the function that shows the solution of the initial value problem $\frac{dy}{dx} = 2x$, $y = 6$ when $x = 1$. Give a reason for the answer.

Choose the correct graph below.

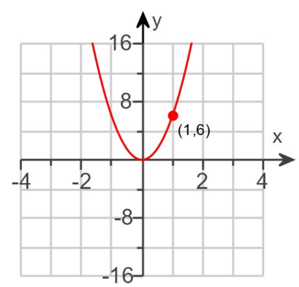
A.



B.



C.



Which of the following is the correct reason for the answer in the previous step?

- **A.** Because the point (1,6) lies on the graph, and it is a straight line.
- **B.** Because the point (1,6) lies on the graph, and it is a parabola not passing through the origin.

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6. Find the function $y(x)$ satisfying $\frac{dy}{dx} = 8x - 3$ and $y(3) = 0$.

The function $y(x)$ satisfying $\frac{dy}{dx} = 8x - 3$ and $y(3) = 0$ is $y(x) = 4x^2 - 3x - 27$.

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7. Solve the following initial value problem.

$$\frac{dy}{dx} = \frac{1}{x^2} + x, \ x > 0; \ y(2) = 2$$

The solution is $y = -\frac{1}{x} + \frac{x^2}{2} + \frac{1}{2}$.

(Type an equation.)

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8. Find the function $y(x)$ satisfying $\frac{dy}{dx} = 6x^{-8/9}$ and $y(-1) = -4$.

The function $y(x)$ satisfying $\frac{dy}{dx} = 6x^{-8/9}$ and $y(-1) = -4$ is $y(x) = 54x^{\frac{1}{9}} + 50$.

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9. Find the function $s(t)$ satisfying $\frac{ds}{dt} = 5 - 8\cos t$ and $s(0) = 6$.

The function satisfying $\frac{ds}{dt} = 5 - 8\cos t$ and $s(0) = 6$ is $s(t) = 5t - 8\sin t + 6$.

10. Solve the following initial value problem.

$$\frac{dr}{d\theta} = -\pi\cos \pi\theta,\ r(0) = 3$$

r = $-\sin(\pi\theta) + 3$ (Type an exact answer, using π as needed.)

11. Solve the following initial value problem.

$$\frac{dr}{d\theta} = \sin(-6\pi\theta),\ r\left(-\frac{1}{12}\right) = 6$$

The solution is $r(\theta) = \frac{\cos(-6\pi\theta)}{6\pi} + 6$.

(Type an exact answer.)

12. For the following function f, find the antiderivative F that satisfies the given condition.

$$f(v) = \frac{1}{2}\sec v \tan v,\ F(0) = 1$$

$F(v) = \frac{1}{2}\sec v + \frac{1}{2}$

13. Find the function y(x) satisfying $\frac{d^2y}{dx^2} = 4 - 36x$, $y'(0) = 5$, and $y(0) = 1$.

The function satisfying $\frac{d^2y}{dx^2} = 4 - 36x$, $y'(0) = 5$, and $y(0) = 1$ is $y(x) = -6x^3 + 2x^2 + 5x + 1$.

14. Solve the initial value problem.

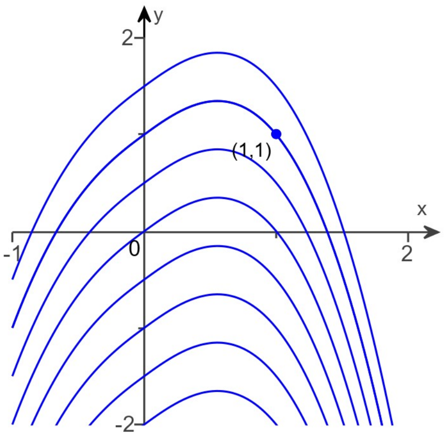
$$\frac{d^2r}{dt^2} = \frac{3}{t^4};\quad \left.\frac{dr}{dt}\right|_{t=3} = 3,\ r(3) = 1$$

$r(t) = \frac{1}{2t^2} + \frac{82}{27}t - \frac{49}{6}$

15. Find the function y(x) satisfying $\frac{d^3y}{dx^3} = 12$, $y''(0) = 14$, $y'(0) = 9$, and $y(0) = 6$.

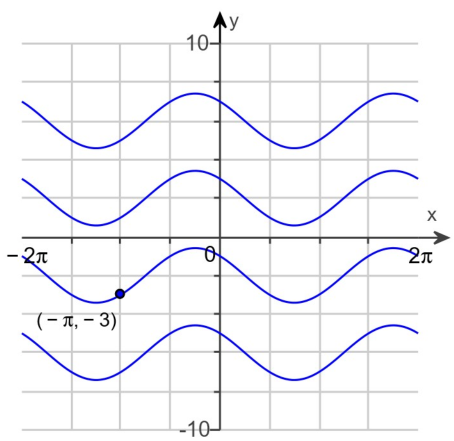
The function y(x) satisfying $\frac{d^3y}{dx^3} = 12$, $y''(0) = 14$, $y'(0) = 9$, and $y(0) = 6$ is $2x^3 + 7x^2 + 9x + 6$.

16. The graph below shows solution curves of the differential equation $\frac{dy}{dx} = 1 - \frac{8}{3}x^{5/3}$. Find an equation for the curve that passes through the labeled point.



$y = -x^{\frac{8}{3}} + x + 1$

17. The graph below shows solution curves of the differential equation $\frac{dy}{dx} = -\sin x - \cos x$. Find an equation for the curve that passes through the labeled point.



$y = \cos x - \sin x - 2$

18. A driver driving along a highway at a steady 33 mph (48 ft/sec) sees an accident ahead and slams on the brakes. What constant deceleration is required to stop the car in 288 ft? To find out, carry out the following steps.

(1) Solve the following initial value problem.

$$\frac{d^2s}{dt^2} = -k \text{ (k constant), with } \frac{ds}{dt} = 48 \text{ and } s = 0 \text{ when } t = 0$$

(2) Find the value of t that makes $\frac{ds}{dt} = 0$. (The answer will involve k.)

(3) Find the value of k that makes s = 288 for the value of t found in the step (2).

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(1) $s = -\frac{kt^2}{2} + 48t$

(2) $t = \frac{48}{k}$, when $\frac{ds}{dt} = 0$

(3) When s = 288 for the value of t found in the step (2), k = 4 .