Name:________________________

Calculus Practice Final 2017

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Express the limit as a definite integral.

1) $\lim_{n \to \infty} \sum_{k=1}^{n} (3c_k^2 - 6c_k + 16)\, \Delta x_k,\ [-9, 2]$ 1) ______________

Use areas to evaluate the integral.

2) $\int_a^b 8x\, dx, \quad 0 < a < b$ 2) ______________

Find the average value over the given interval.

3) $y = 6x + 1;\ [1, 8]$ 3) ______________

Find dy/dx.

4) $\int_{\pi/4}^{\cot x} \csc^2 t\, dt$ 4) ______________

5) $\int_0^x \sqrt{4t + 7}\, dt$ 5) ______________

Solve the initial value problem explicitly.

6) $\frac{du}{dx} = 10x^9 - 4x^3 + 5$ and $u = 2$ when $x = 1$ 6) ______________

Solve the initial value problem using the Fundamental Theorem. Your answer will contain a definite integral.

7) $\frac{dy}{dx} = \cos(x^2)$ and $y = 8$ when $x = 3$ 7) ______________

Solve the initial value problem.

8) $\frac{dy}{dx} = x \sin 3x$ and $y = 6$ when $x = 0$ 8) ______________

Solve the problem.

9) The decay equation for a radioactive substance is known to be $y = y_0 e^{-0.031t}$, with t in days. About how long will it take for the amount of substance to decay to 54% of its original value? 9) ______________

Evaluate the integral.

10) $\int \frac{2x + 23}{x^2 + 11x + 28}\, dx$ 10) ______________

11) $\int \frac{x^2 - 9}{x^2 - 36}\,dx$ 11) ______________

12) $\int \frac{x^4}{x^2 - 9}dx$ 12) ______________

Solve the problem.

13) A car moving with an initial velocity of 3 mph accelerates at the rate of $a(t) = 2.1t$ mph per second for 9 seconds. How fast is the car going when the 9 seconds are up? 13) ______________

14) A car moving with an initial velocity of 9 mph accelerates at the rate of $a(t) = 2.6t$ mph per second for 8 seconds. How far did the car travel during those 8 seconds? 14) ______________

Find the area enclosed by the given curves.

15) Find the area of the region in the first quadrant bounded on the left by the y–axis, below by the line $y = \frac{1}{3}x$, above left by $y = x + 4$, and above right by $y = -x^2 + 10$. 15) ______________

Find the volume of the solid generated by revolving the region bounded by the given lines and curves about the x–axis.

16) $y = \sqrt{2x}$, $y = 2$, $x = 0$ 16) ______________

Find the volume of the solid generated by revolving the region about the given line.

17) The region bounded above by the line $y = 4$, below by the curve $y = 4 - x^2$, and on the right by the line $x = 2$, about the line $y = 4$ 17) ______________

Find the volume of the solid generated by revolving the region about the y–axis.

18) The region enclosed by $x = \frac{y^2}{5}$, $x = 0$, $y = -5$, $y = 5$ 18) ______________

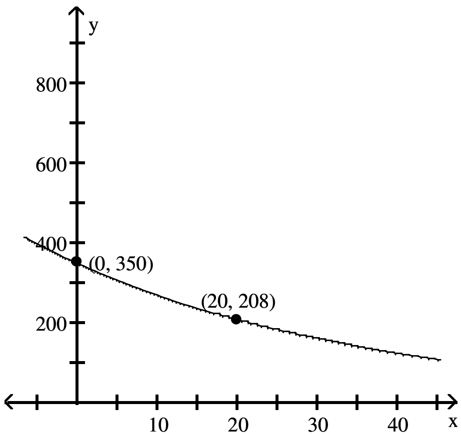
Find the exact length of the curve analytically by antidifferentiation.

19) $x = \frac{2}{3}(y - 1)^{3/2}$ from $y = 1$ to $y = 4$ 19) ______________

20) $y = \int_0^x \sqrt{4 \sin^2 t - 1}\, dt$, $0 \le x \le \frac{\pi}{2}$ 20) ______________

Find the exponential function $y = y_0 e^{kt}$ whose graph passes through the two given points.

21) 21) ______________



Solve the problem.

22) Suppose that the accompanying table shows the velocity of a car every second for 8 seconds. Use the Trapezoidal Rule to approximate the distance traveled by the car in the 8 seconds. 22) ______________

Time (sec)	Velocity (ft/sec)
0	19
1	20
2	21
3	23
4	22
5	24
6	21
7	19
8	20

23) A particle moves with velocity $v(t) = 2t + 3$ find the distance traveled between $t = 0$ and $t = 2$. 23) ______________

Evaluate the integral.

24) $\int (\sqrt{t} - \sqrt[6]{t})\, dt$ 24) ______________

Verify that $\int f(u)\, du \neq \int f(u)\, dx$.

25) $f(u) = \sqrt{u}$ and $u = x^4$ $(x > 0)$. 25) ______________

1) $\int_{-9}^{2} (3x^2 - 6x + 16)\, dx$

2) $4(b^2 - a^2)$

3) 28

4) $-\csc^2 x \csc^2 (\cot x)$

5) $\sqrt{4x + 7}$

6) $u = x^{10} - x^4 + 5x - 3$

7) $y = \int_{3}^{x} \cos(t^2)\, dt + 8$

8) $y = -\frac{x \cos 3x}{3} + \frac{\sin 3x}{9} + 6$

9) 19.9 days

10) $\ln\left|\frac{(x + 4)^5}{(x + 7)^3}\right| + C$

11) $x + \frac{9}{4} \ln\left|\frac{x - 6}{x + 6}\right| + C$

12) $\frac{x^3}{3} + 9x + \frac{27}{2} \ln\left|\frac{x - 3}{x + 3}\right| + C$

13) 88.05 mph

14) 0.082 mi

15) $\frac{73}{6}$

16) 4π

17) $\frac{32}{5}\pi$

18) 50π

19) $\frac{14}{3}$

20) 2

21) $y = 350e^{-0.026t}$

22) 169.5 feet

23) 10

24) $\frac{2}{3}t^{3/2} - \frac{6}{7}t^{7/6} + C$

25) $\int f(u)\, du = \int \sqrt{u}\, du = \frac{2}{3}u^{3/2} + C = \frac{2}{3}(x^4)^{3/2} + C = \frac{2}{3}x^6 + C$

$f(u) = \sqrt{u} = \sqrt{x^4} = x^2.$

$\int f(u)\, dx = \int x^2\, dx = \frac{1}{3}x^3 + C$

So $\int f(u)\, du \neq \int f(u)\, dx$