Name____AP Calc PR 2 Review DATE___________ Time Limit 10 minutes

Question 1 Indefinite Integral

$\int 7xe^{3x^2}\,dx =$

(A) $\frac{1}{42}e^{3x^2} + C$

(B) $\frac{6}{7}e^{3x^2} + C$

(C) $\frac{7}{6}e^{3x^2} + C$

(D) $7e^{3x^2} + C$

(E) $42e^{3x^2} + C$

Question 2: Tangent Line

Find the equation of the tangent line to $9x^2 + 16y^2 = 52$ through $(2, -1)$.

(A) $-9x + 8y - 26 = 0$

(B) $9x - 8y - 26 = 0$

(C) $9x - 8y - 106 = 0$

(D) $8x + 9y - 17 = 0$

(E) $9x + 16y - 2 = 0$

Question 3: position/velocity/acceleration

A particle's position is given by $s = t^3 - 6t^2 + 9t$. What is its acceleration at time $t = 4$?

(A) 0

(B) 9

(C) –9

(D) –12

(E) 12

Question 4: Derivative of an exponential function

If $f(x) = 3^{\pi x}$ then $f'(x) =$

(A) $\dfrac{3^{\pi x}}{\pi \ln 3}$

(B) $\dfrac{3^{\pi x}}{\ln 3}$

(C) $\dfrac{3^{\pi x}}{\pi}$

(D) $\pi(3^{\pi x - 1})$

(E) $\pi \ln 3(3^{\pi x})$

Question 5: Average Value of a function

. The average value of $f(x) = \dfrac{1}{x}$ from $x = 1$ to $x = e$ is

(A) $\dfrac{1}{e+1}$

(B) $\dfrac{1}{1-e}$

(C) $e-1$

(D) $1-\dfrac{1}{e^2}$

(E) $\dfrac{1}{e-1}$

Question 1 Indefinite Integral

$\int 7xe^{3x^2}\,dx =$

(A) $\frac{1}{42}e^{3x^2} + C$

(B) $\frac{6}{7}e^{3x^2} + C$

(C) $\frac{7}{6}e^{3x^2} + C$

(D) $7e^{3x^2} + C$

(E) $42e^{3x^2} + C$

$\int 7xe^{3x^2}\,dx =$

We can use u-substitution to evaluate the integral.

Let $u = 3x^2$ and $du = 6x\,dx$. If we solve the second term for $x\,dx$, we get:

$$\frac{1}{6}du = x\,dx$$

Now we can rewrite the integral as:

$$\frac{7}{6}\int e^u\,du$$

Evaluate the integral to get:

$$\frac{7}{6}e^u + C$$

Now substitute back to get:

$$\frac{7}{6}e^{3x^2} + C$$

The answer is (C).

Question 2: Tangent Line

Find the equation of the tangent line to $9x^2 + 16y^2 = 52$ through $(2, -1)$.

(A) $-9x + 8y - 26 = 0$

(B) $9x - 8y - 26 = 0$

(C) $9x - 8y - 106 = 0$

(D) $8x + 9y - 17 = 0$

(E) $9x + 16y - 2 = 0$

Find the equation of the tangent line to $9x^2 + 16y^2 = 52$ through $(2, -1)$.

First, we need to find $\frac{dy}{dx}$. It's simplest to find it implicitly:

$$18x + 32y\,\frac{dy}{dx} = 0$$

Now solve for $\frac{dy}{dx}$:

$$\frac{dy}{dx} = -\frac{18x}{32y} = -\frac{9x}{16y}$$

Next, plug in $x = 2$ and $y = -1$ to get the slope of the tangent line at the point:

$$\frac{dy}{dx} = \frac{-18}{-16} = -\frac{9}{8}$$

Now use the point-slope formula to find the equation of the tangent line:

$$(y + 1) = \frac{9}{8}(x - 2)$$

If we multiply through by 8, we get: $8y + 8 = 9x - 18$ or $9x - 8y - 26 = 0$.

The answer is (B).

Question 3: position/velocity/acceleration

A particle's position is given by $s = t^3 - 6t^2 + 9t$. What is its acceleration at time $t = 4$?

(A) 0

(B) 9

(C) –9

(D) –12

(E) 12

A particle's position is given by $s = t^3 - 6t^2 + 9t$. What is its acceleration at time $t = 4$?

Acceleration is the second derivative of position with respect to time (velocity is the first derivative).

The first derivative is: $v(t) = 3t^2 - 12t + 9$

The second derivative is: $a(t) = 6t - 12$

Now we simply plug in $t = 4$ and we get: $a(4) = 24 - 12 = 12$

The answer is (E).

Question 4: Derivative of an exponential function

If $f(x) = 3^{\pi x}$ then $f'(x) =$

(A) $\dfrac{3^{\pi x}}{\pi \ln 3}$

(B) $\dfrac{3^{\pi x}}{\ln 3}$

(C) $\dfrac{3^{\pi x}}{\pi}$

(D) $\pi(3^{\pi x - 1})$

(E) $\pi \ln 3(3^{\pi x})$

If $f(x) = 3^{\pi x}$, then $f'(x) =$

The derivative of an expression of the form a^u, where u is a function of x, is:

$$\frac{d}{dx} a^u = a^u (\ln a) \frac{du}{dx}$$

Here, we get:

$$\frac{d}{dx} 3^{\pi x} = 3^{\pi x} (\ln 3)\pi$$

The answer is (E).

Question 5: Average Value of a function

The average value of $f(x) = \frac{1}{x}$ from $x = 1$ to $x = e$ is

(A) $\frac{1}{e+1}$

(B) $\frac{1}{1-e}$

(C) $e - 1$

(D) $1 - \frac{1}{e^2}$

(E) $\frac{1}{e-1}$

The average value of $f(x) = \frac{1}{x}$ from $x = 1$ to $x = e$ is

In order to find the average value, we use the Mean Value Theorem for integrals, which says that the average value of $f(x)$ on the interval $[a,b]$ is $\frac{1}{b-a}\int_a^b f(x)\,dx$.

Here, we have $\frac{1}{e-1}\int_1^e \frac{1}{x}\,dx$.

Evaluating the integral, we get: $\ln x\big|_1^e = \ln e - \ln 1 = 1$. Therefore, the answer is $\frac{1}{e-1}$.

The answer is (E).