1. $\int \left(5e^{2x} + \frac{1}{x}\right) dx =$

(A) $\frac{5}{2}e^{2x} + \frac{2}{x^2} + C$

(B) $\frac{5}{2}e^{2x} + \ln|x| + C$

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

(D) $5e^{2x} + \ln|x| + C$

(E) $10e^{2x} - \frac{1}{x^2} + C$

$\frac{5}{2}e^{2x} + \ln|x| + C$

$\int e^{ax+b}\,dx = \frac{1}{a}e^{ax+b} + C$

2. If $f(x) = \sqrt{x} + \frac{3}{\sqrt{x}}$, then $f'(4) =$

(A) $\frac{1}{16}$ (B) $\frac{5}{16}$ (C) 1 (D) $\frac{7}{2}$ (E) $\frac{49}{4}$

$$f'(x) = \frac{1}{2\sqrt{x}} - \frac{3}{2\sqrt{x^3}}$$

$$f'(4) = \frac{1}{4} - \frac{3}{16} = \frac{4}{16} - \frac{3}{16} = \frac{1}{16}$$

$3x^{-1/2}$

$-\frac{3}{2}x^{-3/2}$

3. $\int x^2\left(x^3+5\right)^6\,dx =$

(A) $\frac{1}{3}\left(x^3+5\right)^6+C$

(B) $\frac{1}{3}x^3\left(\frac{1}{4}x^4+5x\right)^6+C$

(C) $\frac{1}{7}\left(x^3+5\right)^7+C$

(D) $\frac{3}{7}x^2\left(x^3+5\right)^7+C$

(E) $\frac{1}{21}\left(x^3+5\right)^7+C$

$u = x^3+5$

$du = 3x^2\,dx$

$\frac{1}{3}du = x^2\,dx$

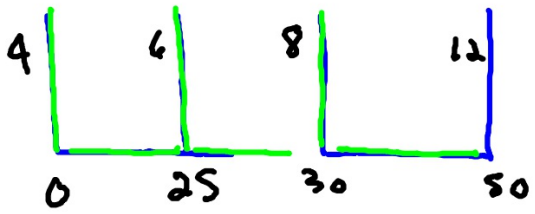
$\frac{1}{3}\int u^6\,du = \frac{1}{3}\,\frac{1}{7}u^7+C$

$= \frac{1}{21}\left(x^3+5\right)^7+C$

x	0	25	30	50
$f(x)$	4	6	8	12

4. The values of a continuous function f for selected values of x are given in the table above. What is the value of the left Riemann sum approximation to $\int_0^{50} f(x)dx$ using the subintervals $[0, 25]$, $[25, 30]$, and $[30, 50]$?

(A) 290 (B) 360 (C) 380 (D) 390 (E) 430



$4(25) + 6(5) + 8(20)$

$100 + 30 + 160$

290

5. Let f be the function defined above, where c is a constant. For what value of c, if any, is f continuous at $x = 2$?

(A) 2 (B) 7 (C) 9 (D) $4\pi - 4$ (E) There is no such value of c.

$$f(x) = \begin{cases} x^2 \sin \pi x & x < 2 \\ x^2 + cx - 18 & x > 2 \end{cases}$$

$$4 \sin 2\pi = 4 + 2c - 18$$

$$0 = 2c - 14$$

$$c = 7$$

10

6. Which of the following is an antiderivative of $3\sec^2 x + 2$?

(A) $3\tan x$ (B) $3\tan x + 2x$ (C) $3\sec x + 2x$ (D) $\sec^3 x + 2x$ (E) $6\sec^2 x \tan x$

$3\tan x + 2x$

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

7. If $f(x) = x^2 - 4$ and g is a differentiable function of x, what is the derivative of $f(g(x))$?

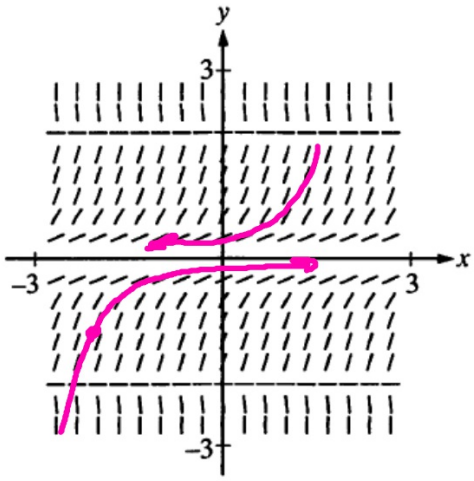
(A) $2g(x)$ (B) $2g'(x)$ (C) $2xg'(x)$ (D) $2g(x)g'(x)$ (E) $2g(x) - 4$

$f'(g(x))\, g'(x)$

$f'(x) = 2x$

$f'(g(x)) = 2g(x)$

$2g(x)\, g'(x)$



8. Shown above is a slope field for the differential equation $\frac{dy}{dx} = y^2\left(4 - y^2\right)$. If $y = g(x)$ is the solution to the differential equation with the initial condition $g(-2) = -1$, then $\lim_{x \to \infty} g(x)$ is

(A) $-\infty$ (B) -2 (C) 0 (D) 2 (E) 3

9. If $f''(x) = x(x+2)^2$, then the graph of f is concave up for

(A) $x < 0$

(B) $x > 0$

(C) $-2 < x < 0$

(D) $x < -2$ and $x > 0$

(E) all real numbers

$f'' > 0$

$(x+2)^2 > 0$

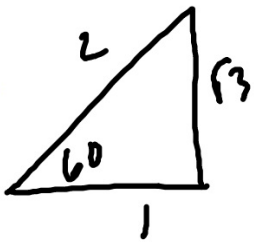
so $x > 0$

10. If $y = \sin x \cos x$, then at $x = \frac{\pi}{3}$, $\frac{dy}{dx} =$

(A) $-\frac{1}{2}$ (B) $-\frac{1}{4}$ (C) $\frac{1}{4}$ (D) $\frac{1}{2}$ (E) 1

$\sin\frac{\pi}{3}$

$\cos\frac{\pi}{3}$



$$\frac{dy}{dx} = -\sin x \sin x + \cos x \cos x$$

$$= -\left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{3}}{2}\right) + \frac{1}{2}\frac{1}{2}$$

$$= -\frac{3}{4} + \frac{1}{4}$$

$$= -\frac{2}{4}$$

$$= -\frac{1}{2}$$