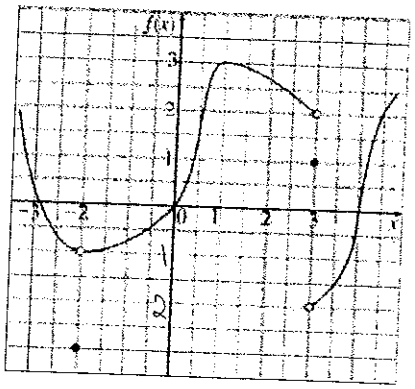
Name Answer Key P:

Use the graph below for the following four questions:



1. For the function whose graph is given above, determine $\lim_{x \to 3^+} f(x)$.

(A) -3 (B) -2 (C) -1 (D) 0
(E) 1 (F) 2 (G) 3 (H) Does not exist

2. For the function whose graph is given above, determine $\lim_{x \to 3} f(x)$.

(A) -3 (B) -2 (C) -1 (D) 0
(E) 1 (F) 2 (G) 3 (H) Does not exist

3. For the function whose graph is given above, determine $\lim_{x \to -2^-} f(x)$.

(A) -3 (B) -2 (C) -1 (D) 0
(E) 1 (F) 2 (G) 3 (H) Does not exist

4. For the function whose graph is given above, determine $\lim_{x \to -2} f(x)$.

(A) -3 (B) -2 (C) -1 (D) 0
(E) 1 (F) 2 (G) 3 (H) Does not exist

5. Find the value of the limit $\lim_{x \to 1} \dfrac{2x^2 + x - 3}{x^2 - x}$.

(A) 5 (B) 4 (C) 3 (D) 2
(E) $\frac{7}{2}$ (F) $\frac{3}{2}$ (G) $\frac{1}{2}$ (H) 0

6. Find the value of the limit $\lim_{x \to \infty} \dfrac{7 + 3x}{4 - x}$.

(A) $\frac{3}{4}$ (B) 3 (C) 7 (D) $-\frac{3}{4}$
(E) -3 (F) $-\frac{7}{4}$ (G) -7 (H) $\frac{7}{4}$

7. Find the value of the limit $\lim_{x\to\infty} \dfrac{4x^2-3x+5}{7+2x-2x^2}$.

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

(E) -1 (F) $-\frac{4}{7}$ (G) -2 (H) $\frac{4}{7}$

8. Find the value of x at which the curve $y = \dfrac{2x+1}{2x^2+7x+3}$ has a vertical asymptote.

(A) -4 (B) -3 (C) -2 (D) -1

(E) $-\frac{1}{2}$ (F) 1 (G) 2 (H) 3

9. Find the value of x at which the curve $y = \dfrac{x^2-16}{x^2-5x+4}$ has a vertical asymptote.

(A) -4 (B) -3 (C) -2 (D) -1

(E) 0 (F) 1 (G) 2 (H) 3

10. Find the derivative of $f(t) = \sqrt{t^5} + \sqrt[5]{t^2}$.

(A) $5t^{-1/2} + 2t^{-3/2}$ (B) $\frac{5}{2}t^{1/2} - \frac{2}{5}t^{3/5}$ (C) $\frac{5}{2}t^{3/2} + \frac{2}{5}t^{-3/5}$ (D) $\frac{2}{5}t^{3/2} + \frac{5}{2}t^{-3/5}$

(E) $5\sqrt{t^4} + 2\sqrt[5]{t}$ (F) $\frac{5}{2}t^4 - \frac{2}{5}t$ (G) $\frac{2}{5}t^{3/2} - \frac{2}{3}t^{3/2}$ (H) None of these

11. Find the derivative of $f(x) = e^x(x^2+2)$.

(A) $2xe^x$ (B) $e^x(2x+2)$ (C) $2x^2e^{x-1}$ (D) $e^x(x^2+2x)$

(E) x^2e^{x-1} (F) $e^x(x^2+2x+2)$ (G) $e^x(2x+2)$ (H) None of these

12. Find the derivative of $f(x) = \dfrac{x}{x^2+3}$.

(A) $\dfrac{1}{2x+3}$ (B) $\dfrac{-3+x^2}{(x^2+3)^2}$ (C) $\dfrac{3-x^2}{(x^2+3)^2}$ (D) $\dfrac{3-x^2}{(x^2+3)}$

(E) $\dfrac{3}{(x^2+3)^2}$ (F) $\dfrac{1}{2x}$ (G) $\dfrac{3-x}{(x^2+3)^2}$ (H) None of these

13. If $f(x) = \dfrac{e^x}{x}$, find $f''(x)$.

(A) $\dfrac{e^x(x+4)}{x^4}$ (B) $\dfrac{e^x(x^2-1)}{x^4}$

(C) $\dfrac{e^x(x^2+x)}{x^4}$ (D) $\dfrac{e^x(x^2+3)}{x^4}$

(E) $\dfrac{e^x(x-2)}{x^3}$ (F) $\dfrac{e^x(x^2+5x)}{x^3}$

(G) $\dfrac{e^x(x^2-2x+2)}{x^3}$ (H) $\dfrac{e^x(x^3-4x^2+3)}{x^3}$

14. Find the derivative of $f(x) = x^2 \cos x$.

(A) $2x \cos x$
(B) $2x \cos x - x^2 \sin x$
(C) $-2x \sin x$
(D) $2x \cos x + x^2 \sin x$
(E) $2x \sin x$
(F) $3x^2 \cos(x^3)$
(G) $-x^2 \sin x$
(H) None of the above

15. Find the derivative of $f(x) = \cos x - \sin x$.

(A) $\sin x + \cos x$
(B) $-\sin x + \cos x$
(C) $\sin x - \cos x$
(D) $-\sin x - \cos x$
(E) $2 \sin x$
(F) $2 \cos x$
(G) $-2 \sin x$
(H) $-2 \cos x$

16. Let $f(x) = x \ln(x^2 - 3)$. Find the value of $f'(2)$.

(A) 0
(B) 2
(C) 4
(D) 6
(E) 8
(F) 10
(G) 12
(H) 14

17. Let $f(x) = \ln(\sin^2 x + 1)$. Find the value of $f'\left(\frac{\pi}{4}\right)$.

(A) 0
(B) $\frac{1}{2}$
(C) $\frac{2}{3}$
(D) 1
(E) $\frac{3}{2}$
(F) $\sqrt{2}$
(G) 2
(H) 3

18. Find the absolute minimum and maximum values of the function $f(x) = 4x^3 - 15x^2 + 12x + 7$ on the closed interval $[0, 3]$.

(A) 0, 3
(B) 0, 5
(C) 3, 5
(D) 3, 9.75
(E) 3, 16
(F) 5, 7
(G) 7, 16
(H) 5, 10.25

19. Find the minimum and maximum values of $y = x^3 - 9x + 8$ on the interval $[-3, 1]$.

(A) $8, 8 + 6\sqrt{3}$
(B) $0, 8 + 6\sqrt{3}$
(C) $0, 8$
(D) $8, 8 + \sqrt{3}$
(E) $0, 8 + \sqrt{3}$
(F) $8 + \sqrt{3}, 8 + 6\sqrt{3}$
(G) $\sqrt{3}, 8$
(H) $\sqrt{3}, 8 + 6\sqrt{3}$

20. Find the most general antiderivative of the function $f(x) = \dfrac{2+x^3}{x^3}$.

(A) $\dfrac{2+3x^2}{3x^2} + C$ (B) $\dfrac{2x+\frac{1}{4}x^4}{x^4} + C$ (C) $-\dfrac{1}{x^2} + 1 + C$ (D) $-\dfrac{1}{x^2} + C$

(E) $\dfrac{1}{x^2} + x + C$ (F) $\dfrac{1}{x^2} + 1 + C$ (G) $-\dfrac{1}{x^2} + x + C$ (H) $\dfrac{2}{x^2} + C$

21. Find the value of the integral $\displaystyle\int_1^3 \frac{1}{x^2}\,dx$.

(A) $\frac{2}{3}$ (B) $\frac{1}{2}$ (C) $-\frac{1}{2}$ (D) $-\frac{1}{3}$

(E) $-\frac{2}{3}$ (F) 1 (G) $\frac{1}{3}$ (H) -1

22. Find the value of the integral $\displaystyle\int_1^2 \frac{x^2-1}{x}\,dx$.

(A) $\frac{1}{2}$ (B) 1 (C) $\frac{3}{2}$ (D) 2

(E) $\frac{1}{2}\ln 2$ (F) $1+\ln 2$ (G) $\frac{3}{2} - \ln 2$ (H) $2+\ln 2$

23. Find the value of the integral $\displaystyle\int_0^1 \frac{x^2}{(x^3+1)^2}\,dx$.

(A) $\frac{3}{4}$ (B) 2 (C) $\frac{3}{7}$ (D) $\frac{7}{3}$

(E) $\frac{1}{6}$ (F) $\frac{3}{2}$ (G) $\frac{2}{3}$ (H) 1

24. Find the value of $\displaystyle\int_e^{e^2} \frac{(\ln x)^2}{x}\,dx$.

(A) $\ln 2$ (B) $\frac{1}{2}\ln 2$ (C) $\frac{1}{2}$ (D) $\frac{3}{2}$

(E) 1 (F) $1/(\ln 2)$ (G) 0 (H) $\frac{7}{3}$

25. Find the value of the integral $\displaystyle\int_0^1 \frac{e^x}{e^x+1}\,dx$.

(A) $e+1$ (B) $\ln(e-1)$ (C) $\dfrac{e-1}{2}$ (D) $\ln\dfrac{e+1}{2}$

(E) $\frac{1}{2}\ln(e-1)$ (F) $\dfrac{e+1}{2}$ (G) $\frac{1}{2}\ln(e+1)$ (H) $e-1$

26. Evaluate the following integrals:

(a) $\displaystyle\int x^3\cos(x^4+1)\,dx$

(b) $\displaystyle\int \frac{\cos(\sqrt{x})}{\sqrt{x}}\,dx$

(c) $\displaystyle\int \frac{\cos(1/x)}{x^2}\,dx$

(d) $\displaystyle\int \frac{\cos(\arctan x)}{1+x^2}\,dx$

27. Evaluate the following integrals:

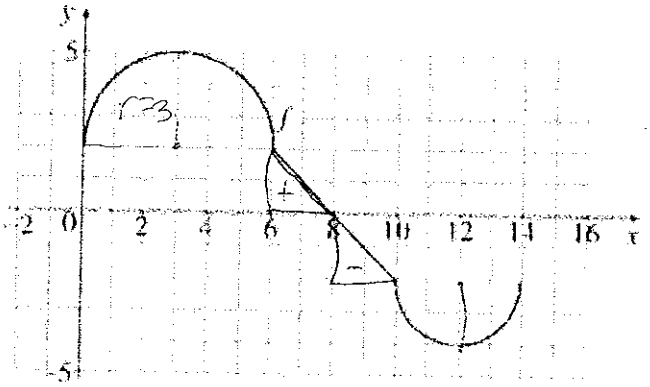
(a) $\int x^3 e^{(x^4+1)}\,dx$ $\frac{e^{x^4+1}}{4}+C$

(b) $\int \frac{e^{(\sqrt{x})}}{\sqrt{x}}\,dx$ $2e^{\sqrt{x}}+C$

(c) $\int \frac{e^{(1/x)}}{x^2}\,dx$ $-e^{1/x}+C$

(d) $\int \frac{e^{(\arctan x)}}{1+x^2}\,dx$ $e^{\arctan x}+C$

28. Find the net area of the given region from 0 to 14.



$\frac{\pi 3^2}{2}+\frac{\pi 2^2}{2}=\frac{(9+4)\pi}{2}=\frac{13\pi}{2}$

29. Find the derivative of each of the following functions.

a. $f(x)=\frac{2}{3}\cos^3(3x)$

$f'(x)=2(\cos(3x))^2\cdot 3(-\sin(3x))$

$f'(x)=-6\sin(3x)\cos^2(3x)$

b. $f(x)=\ln(5x^2+4)$.

$f'(x)=\frac{10x}{5x^2+4}$

c. $f(x)=\ln(\sin^2 x)$

$f'(x)=\frac{2\sin x\cos x}{\sin^2 x}$

$f'(x)=\frac{2\cos x}{\sin x}=2\cot x$

d. $f(x)=\frac{2}{3}e^{-x^5}$

$f'(x)=\frac{2}{3}(-5x^4)e^{-x^5}$

$f'(x)=-\frac{10}{3}x^4e^{-x^5}$

30. Use the first derivative test to find the intervals of increase and decrease for the function $f(x) = \frac{3}{2}x^4 - 5x^3 - \frac{9}{2}x^2 + 5$.

$f'(x) = 4\left(\frac{3}{2}x^3\right) - 15x^2 - \frac{18}{2}x \qquad 6x^3 - 15x^2 - 9x$

$(-\infty, -\frac{1}{2})(-\frac{1}{2}, 0)(0, 3)(3, \infty) \qquad 3x(2x^2 - 5x - 3)$

$3x(2x+1)(x-3)$

$0, -\frac{1}{2}, 3$

31. Find the intervals where f is concave up and concave down for $f(x) = 2x^4 - 3x^3 + x - 10$.

$f' = 8x^3 - 9x^2 + 1 \qquad x = 0, \frac{3}{4}$

$f'' = 24x^2 - 18x$

$f'' = 3x(8x - 6)$

$(-\infty, 0)(0, \frac{3}{4})(\frac{3}{4}, \infty)$

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32. Find each indefinite integral.

a. $\int \frac{5x^2 - \sqrt{x}}{x} dx \qquad \int 5x - x^{-\frac{1}{2}} dx$

$\frac{5}{2}x^2 - 2x^{\frac{1}{2}} + C$

b. $\int 3x^2 + 4x - 21 \; dx$

$\frac{3x^3}{3} + \frac{4x^2}{2} - 21x + C$

$x^3 + 2x^2 - 21x + C$

c. $\int 5\sin\theta - 3\cos\theta \; d\theta$

$-5\cos\theta - 3\sin\theta + C$

33. Solve the differential equations.

a. $\frac{dZ}{dx} = 20x^4 - 3x^3, Z(0) = 3$

$Z = \frac{20x^5}{5} - \frac{3x^4}{4} + C$

$Z = 4x^5 - \frac{3}{4}x^4 + C$

b. $\frac{dQ}{dy} = 4\sin y + 2y, Q(0) = 7$

$Q = -4\cos y + y^2 + 7$