

## MATH 75 - Practice Final - Spring 2005

---

1. Find  $f'(x)$  if  $f(x) = 4x^4 - 2x^3 + 3x - 2$ .

- (a)  $4x^3 - 6x^2 + 3$
  - (b)  $16x^3 - 6x^2 + 3x - 2$
  - (c)  $16x^3 - 6x^2 + 3$
  - (d)  $16x^3 - 3x^2 + 3$
  - (e)  $4x^3 - 2x^2 + 3$
- 

2.  $f(x) = 2x^{\frac{3}{2}} + 10x^{\frac{1}{2}}$ ,  $f'(x) =$

- (a)  $x^{\frac{1}{2}} - 5x^{-\frac{1}{2}}$
  - (b)  $3x^{-\frac{1}{2}} + x^{-\frac{1}{2}}$
  - (c)  $3x^{-\frac{1}{2}} + 5x^{-\frac{3}{2}}$
  - (d)  $x^{\frac{1}{2}} + x^{-\frac{1}{2}}$
  - (e)  $3x^{\frac{1}{2}} + 5x^{-\frac{1}{2}}$
- 

3.  $h(x) = 3 - 2x^3 + 10x^4$ ,  $h'(x) =$

- (a)  $40x^4 - 6x^3$
  - (b)  $40x^3 - 6x^2$
  - (c)  $14x^3 - 5x^2$
  - (d)  $40x^3 - 6x^2 + 3x$
  - (e)  $4x^3 - 3x^2$
- 

4.  $g(x) = x^5 - x^3 + x - 1$ ,  $g'(x) =$

- (a)  $x^4 - x^2 + 1$
  - (b)  $5x^4 - 3x^2$
  - (c)  $5x^4 - 3x^2 + x$
  - (d)  $5x^4 - 3x^2 + 1$
  - (e)  $4x^4 - 2x^2 + x + 1$
- 

5. Find  $f'(1)$  if  $f(x) = \frac{3x^2 - 2}{x^2 - x + 2}$ .

- (a)  $11/4$
  - (b)  $-11/6$
  - (c)  $-11/4$
  - (d)  $11/3$
  - (e)  $11/6$
-

6. Find  $f'(0)$  if  $f(x) = \frac{3x-4}{4x+3}$ .

- (a)  $\frac{25}{9}$
  - (b)  $\frac{5}{9}$
  - (c) 4
  - (d)  $\frac{25}{3}$
  - (e) 5
- 

7. Find  $f'(0)$  if  $f(x) = \frac{3x-4}{4x^2+3}$ .

- (a)  $\frac{3}{2}$
  - (b)  $\frac{2}{3}$
  - (c)  $-1$
  - (d) 4
  - (e) 1
- 

8. Find  $y'(1)$  if  $y = 2(3x^2 - 4x + 2)^4$ .

- (a) 16
  - (b) 5
  - (c) 18
  - (d)  $-5$
  - (e) 4
- 

9. Find  $f'(x)$  if  $f(x) = (x^3 - 2x + 3)^5$ .

- (a)  $f'(x) = (3x^2 - 2)(x^3 - 2x + 3)^3$
  - (b)  $f'(x) = 5(3x^2 - 2)^4$
  - (c)  $f'(x) = 5(3x^2 - 2)(x^3 - 2x + 3)^4$
  - (d)  $f'(x) = 5(x^3 - 2x + 3)^4$
  - (e)  $f'(x) = (3x^2 - 2)(x^3 - 2x + 3)^5$
- 

10. If  $g(t) = (t^3 - 2)^3(t - 2)^5$  find  $g'(1)$ .

- (a)  $-14$
  - (b) 30
  - (c)  $-20$
  - (d)  $-40$
  - (e) 32
-

11. If  $f(x) = (x^2 - 2x)^2(x + 2)^3$  find  $f'(1)$ .
- (a) 27
  - (b) 5
  - (c) -6
  - (d) 10
  - (e) 20
- 

12. Find  $y'$  if  $y = \sin x + \tan x + x$ .
- (a)  $\cos x + \csc^2 x + 1$
  - (b)  $\cos x + \sec^2 x$
  - (c)  $\cos x - \sec^2 x + 1$
  - (d)  $-\cos x + \sec^2 x + 1$
  - (e)  $\cos x + \sec^2 x + 1$
- 

13. Find  $f'(x)$  if  $f(x) = 3 \cos x - \csc x + x \sin x$ .
- (a)  $2 \sin x - \csc x \cot x + x \cos x$
  - (b)  $-2 \sin x + 2 \csc x \cot x + 2x \cos x$
  - (c)  $-2 \sin x + \csc x \cot x + x \cos x$
  - (d)  $2 \sin x + \csc x \cot x + \cos x$
  - (e)  $-2 \sin x + \csc x \cot x - x \sin x$
- 

14. Find  $f'(x)$  if  $f(x) = \tan^2 x + \frac{1}{1 - \sin x}$ .
- (a)  $2 \tan x \csc^2 x + \frac{\cos x}{(1 + \sin x)^3}$
  - (b)  $2 \tan x \sec^2 x + \frac{\cos x}{(1 - \sin x)^2}$
  - (c)  $\tan x \sec^2 x + \frac{\cos x}{1 - \sin x}$
  - (d)  $\frac{\cos x}{(1 - \sin x)^2}$
  - (e)  $2 \tan x \sec^2 x$
- 

15. Find  $y'$  if  $y = \frac{3 \cos x}{\sin x}$ .
- (a)  $y' = \csc^2 x$
  - (b)  $y' = -3 \sin^2 x$
  - (c)  $y' = 3 \cot^2 x$
  - (d)  $y' = \csc^3 x$
  - (e)  $y' = -3 \csc^2 x$
-

16. Find  $y'$  if  $y = 3\pi^3 + \frac{2x}{\pi}$ .

(a)  $9\pi^2 - \frac{2x}{\pi}$

(b)  $\frac{2x}{\pi}$

(c)  $\frac{2}{\pi}$

(d)  $-\frac{2x}{\pi^2}$

(e)  $\frac{\pi - x}{\pi^2}$

---

17.  $f(x) = \frac{\pi - 100x}{50}$ .

(a)  $f'(x) = \frac{-100x}{50}$

(b)  $f'(x) = -2$

(c)  $f'(x) = -100$

(d)  $f'(x) = \frac{-x}{50}$

(e)  $f'(x) = -2x$

---

18. Find  $f'(2)$  if  $f(x) = \frac{8}{x^4} + 2\sqrt{2}\sqrt{x}$ .

(a)  $\frac{4}{5}$

(b) 1

(c)  $-\frac{4}{5}$

(d) 0

(e) 3

---

19. Find  $f'(8)$  if  $f(x) = 6\sqrt[3]{x} - \frac{32}{x}$ .

(a) 1

(b) 2

(c) -2

(d) 6

(e) -4

---

20. Find  $y'(1)$  if  $y = \sqrt{6x - 2}$ .

(a)  $\frac{1}{12}$

(b)  $\frac{3}{2}$

(c)  $\frac{2}{3}$

(d)  $\frac{1}{4}$

(e) 12

---

21.  $f(x) = 3\sqrt{1-2x}$ ,  $f'(x) =$

- (a)  $-\frac{3}{\sqrt{1-2x}}$
  - (b)  $3(1-2x)^{\frac{3}{2}}$
  - (c)  $\frac{1}{\sqrt{1-2x}}$
  - (d)  $6(1-2x)^{\frac{1}{2}}$
  - (e)  $\frac{3x}{\sqrt{1-2x}}$
- 

22. Find  $y'(1)$  if  $y = \frac{8}{\sqrt{x^3+3x}}$ .

- (a)  $-3$
  - (b)  $\frac{1}{16}$
  - (c)  $3$
  - (d)  $6$
  - (e)  $-6$
- 

23.  $f(x) = \frac{3}{\sqrt{1-4x}}$ ,  $f'(x) =$

- (a)  $\frac{4}{(1-4x)^{\frac{1}{2}}}$
  - (b)  $-\frac{4}{(1-4x)^{\frac{3}{2}}}$
  - (c)  $\frac{6}{(1-4x)^{\frac{3}{2}}}$
  - (d)  $-\frac{4}{(1-4x)^{\frac{1}{2}}}$
  - (e)  $\frac{-4x}{(1-4x)^{\frac{3}{2}}}$
- 

24.  $\int (3x^2 - 4x + 1) dx =$

- (a)  $3x^3 - 4x^2 + x + C$
  - (b)  $6x - 4 + C$
  - (c)  $x^3 - 2x^2 + C$
  - (d)  $x^3 - 2x^2 + x + C$
  - (e)  $x^3 + 4x^2 + x + C$
-

25.  $\int (\pi + 4x - 25x^4) dx =$
- (a)  $x + 2x^2 - 25x^5 + C$
  - (b)  $\pi + 4x^2 - 5x^5 + C$
  - (c)  $\pi x + 4x^2 - 25x^5 + C$
  - (d)  $\pi x + 2x^2 - 5x^5 + C$
  - (e)  $\pi x - 2x^3 - 5x^5 + C$
- 

26.  $\int \left( \frac{1}{x^4} + \frac{1}{\sqrt{x}} \right) dx =$
- (a)  $\frac{2}{3x^3} + 2\sqrt{x}$
  - (b)  $-\frac{1}{x^2} + 2\sqrt{x}$
  - (c)  $-\frac{1}{3x^3} + 2\sqrt{x}$
  - (d)  $\frac{1}{3x^3} + \sqrt{x}$
  - (e)  $-\frac{1}{3x^5} - 2\sqrt{x}$
- 

27.  $\int (\sin x + 4 \cos 2x) dx = .$
- (a)  $-\cos x + 4 \sin 2x + C$
  - (b)  $\cos x - 4 \sin 2x + C$
  - (c)  $\cos x - 2 \sin 2x + C$
  - (d)  $-\cos x - 4 \sin 2x + C$
  - (e)  $-\cos x + 2 \sin 2x + C$
- 

28.  $\int (3 \sec^2 x + \csc x \cot x) dx =$
- (a)  $3 \cot x - \csc x + C$
  - (b)  $\tan x - \sec x + C$
  - (c)  $3 \cot x - \tan x + C$
  - (d)  $\tan x - 3 \csc x + C$
  - (e)  $3 \tan x - \csc x + C$
- 

29.  $\int \sin(3x) dx =$
- (a)  $\frac{1}{3} \sin(3x) + C$
  - (b)  $\sin 3 + C$
  - (c)  $\cos(3x) + C$
  - (d)  $\cos(3x) + C$
  - (e)  $-\frac{1}{3} \cos(3x) + C$
-

30.  $\int \cos(5x + 1) dx =$
- (a)  $-\frac{1}{4} \sin(5x + 1) + C$
  - (b)  $\frac{1}{5} \sin(5x + 1) + C$
  - (c)  $\frac{1}{5} \sin(5) + C$
  - (d)  $\frac{1}{5} \sin(5x^2 + 1) + C$
  - (e)  $\sin(5x + 1) + C$
- 

31.  $\int 2 \sec^2 x dx =$
- (a)  $-2 \cot x + C$
  - (b)  $\frac{2}{3} \sec^3 x + C$
  - (c)  $4 \sec x + C$
  - (d)  $2 \tan x + C$
  - (e)  $2 \sec x \tan x + C$
- 

32.  $\int (\pi \sec x \tan x + \csc^2 x) dx =$
- (a)  $\pi \csc x - \tan x + C$
  - (b)  $\pi \sec x - \cot x + C$
  - (c)  $\pi \csc x + \tan x + C$
  - (d)  $\sec x + \cot x + C$
  - (e)  $\pi \sec x - \pi \cot x + C$
- 

33.  $\int \cos x \sin^3 x dx =$
- (a)  $3 \cos x \sin^2 x + C$
  - (b)  $-\frac{1}{4} \cos^4 x + C$
  - (c)  $\frac{1}{3} \sin^3 x + C$
  - (d)  $\frac{1}{4} \sin^4 x + C$
  - (e)  $\sin^2 x \cos^3 x + C$
- 

34.  $\int 10 \sec^2 x \tan^4 x dx =$
- (a)  $4 \tan^4 x + C$
  - (b)  $2 \cot^5 x + C$
  - (c)  $2 \sec x \tan^5 x + C$
  - (d)  $2 \tan^5 x + \sec x + C$
  - (e)  $2 \tan^5 x + C$
-

35.  $\int 9x(x^2 - 5)^2 dx =$
- (a)  $\frac{3}{2}(x^2 - 5)^3 + C$
  - (b)  $\frac{(x^3 - 5)^3}{3} + C$
  - (c)  $(x^3 - 5)^3 + C$
  - (d)  $18x(3x^2 - 5)^3 + C$
  - (e)  $18(x^3 - 5) + C$
- 

36.  $\int \frac{2x + 5}{(x^2 + 5x)^2} dx =$
- (a)  $-\frac{2x}{x^2 + 5} + C$
  - (b)  $-\frac{1}{x^2 + 5} + C$
  - (c)  $\frac{x}{x^2 + 5} + C$
  - (d)  $\frac{2x}{x^2 + 5} + C$
  - (e)  $-\frac{4}{x^2 + 5} + C$
- 

37.  $\int \frac{4x - 10}{(x^2 - 5x)^3} dx =$
- (a)  $-\frac{2x}{(x^2 - 5x)^2} + C$
  - (b)  $-\frac{1}{(x^2 - 5x)^2} + C$
  - (c)  $\frac{4}{(x^2 - 5x)^2} + C$
  - (d)  $\frac{2}{(x^2 - 5x)^2} + C$
  - (e)  $-\frac{2x - 5}{(x^2 - 5x)^2} + C$
- 

38. Find  $f'(2)$  if  $f(x) = \frac{1}{(x^2 - 3)^3}$ .
- (a)  $-12$
  - (b)  $-\frac{4}{3}$
  - (c)  $12$
  - (d)  $-\frac{1}{12}$
  - (e)  $\frac{1}{12}$
-

39. Find  $f'(2)$  if  $f(x) = \frac{2}{(2x^2 - 6)^3}$ .

- (a)  $-5$
  - (b)  $7$
  - (c)  $-3$
  - (d)  $6$
  - (e)  $-6$
- 

40. The asymptotes of  $f(x) = \frac{5x^2 - 2x + 1}{x^2 - 4}$  are

- (a)  $y = 5$  and  $x = 2$
  - (b)  $x = 2$  and  $x = -2$
  - (c)  $y = 5$
  - (d)  $x = 2$ ,  $x = -2$  and  $y = 5$
  - (e)  $x = 2$
- 

41. The asymptotes of  $f(x) = \frac{x^2 - 2x + 1}{x^2 - 3x + 2}$  are

- (a)  $x = 2$  and  $y = 1$
  - (b)  $x = 1$ ,  $x = 2$  and  $y = 1$
  - (c)  $x = 1$  and  $y = 1$
  - (d)  $x = 1$  and  $x = 2$
  - (e)  $y = 1$
- 

42. Compute  $\lim_{x \rightarrow -4} \frac{x^2 + x - 12}{x^2 + 6x + 8}$ .

- (a)  $\frac{7}{2}$
  - (b)  $1$
  - (c)  $\frac{5}{6}$
  - (d)  $\infty$
  - (e)  $-\infty$
- 

43. Compute  $\lim_{x \rightarrow -\infty} \frac{1 - 3x}{\sqrt{x^2 - 4}}$ .

- (a)  $\frac{3}{2}$
  - (b)  $3$
  - (c)  $-\frac{3}{2}$
  - (d)  $-3$
  - (e)  $\frac{3}{\sqrt{2}}$
-

44. Compute  $\lim_{x \rightarrow -3} \frac{x^2 - x - 6}{x^2 + 9}$ .
- (a)  $\infty$
  - (b)  $\frac{1}{6}$
  - (c)  $-\infty$
  - (d)  $\frac{1}{3}$
  - (e) 6
- 

45. Compute  $\lim_{x \rightarrow -3} \frac{x^2 + x - 6}{x + 9}$ .
- (a)  $\infty$
  - (b)  $\frac{1}{6}$
  - (c)  $-\infty$
  - (d)  $\frac{1}{3}$
  - (e) 0
- 

46. Compute  $\lim_{x \rightarrow 2} (x^3 - 3x^2 + 6x + 2)$ .
- (a) 10
  - (b) 18
  - (c) 8
  - (d) -4
  - (e) -10
- 

47. Compute  $\lim_{x \rightarrow -1} (x^3 - 3x^2 + 6x + 2)^2$ .
- (a)  $\infty$
  - (b) 64
  - (c)  $-\infty$
  - (d) Does not exist
  - (e) 0
- 

48. Evaluate  $\lim_{x \rightarrow 6} \frac{\sqrt{x+10} - 4}{x - 6}$ .
- (a) 0
  - (b)  $\frac{1}{8}$
  - (c)  $\frac{1}{4}$
  - (d)  $\frac{1}{6}$
  - (e)  $\infty$
-

49. Evaluate  $\lim_{x \rightarrow 0} \frac{10 - \sqrt{x + 100}}{x}$ .
- (a)  $\infty$
  - (b)  $-\infty$
  - (c)  $-\frac{1}{10}$
  - (d)  $-\frac{1}{20}$
  - (e) 0
- 

50. Evaluate  $\lim_{x \rightarrow 0} \frac{x}{7 - \sqrt{x + 49}}$ .
- (a) -14
  - (b) 14
  - (c) 7
  - (d)  $\infty$
  - (e) Does not exist

51. Compute  $\lim_{x \rightarrow \infty} \frac{5x^3 - 5x^2 + 5}{3 - 2x^3}$ .
- (a)  $-\infty$
  - (b)  $\infty$
  - (c)  $\frac{2}{5}$
  - (d) 0
  - (e)  $-\frac{5}{2}$
- 

52. Compute  $\lim_{x \rightarrow \infty} \frac{5x^3 - 5x^2 + 5}{3x - 2x^4}$ .
- (a)  $-\infty$
  - (b)  $\infty$
  - (c)  $\frac{2}{5}$
  - (d) 0
  - (e)  $\frac{5}{2}$
- 

53. Find the vertical asymptotes for the graph of the function  $f(x) = \frac{x^2 + 3x + 2}{x^2 - 1}$ .
- (a)  $y = -1$
  - (b)  $x = -1$
  - (c)  $y = -2$
  - (d)  $x = 1$
  - (e)  $x = -1$  and  $x = 1$
-

54. Find the horizontal asymptotes for the graph of the function  $f(x) = \frac{6x^2 + 5x - 3}{x^2 + 2x + 1}$ .
- (a)  $x = -1$
  - (b)  $x = 0$
  - (c)  $y = -3$
  - (d)  $y = 0$
  - (e)  $y = 6$
- 

55. Find the slope of the tangent line to the curve  $2y + y^2 - 2x^2 = yx^2$  at the point  $(2, 4)$ .
- (a) 4
  - (b)  $-\frac{1}{4}$
  - (c) 0
  - (d)  $\frac{4}{3}$
  - (e) 16
- 

56. Find the slope of the tangent line to the curve  $y + \sin x = \cos y - 1$  at the point  $(\pi, 0)$ .
- (a)  $-\pi$
  - (b)  $\pi$
  - (c) 1
  - (d)  $1 - \pi$
  - (e) 2
- 

57. How many local maxima does the graph of  $y = 3 + \cos(2x)$  have?
- (a) 0
  - (b) 1
  - (c) 2
  - (d) 3
  - (e) infinitely many
- 

58.  $y = 2x^6 - 12x^4 + 1$  has local minima at
- (a)  $x = -2$
  - (b)  $x = -2$  and  $x = 2$
  - (c)  $x = 2$
  - (d)  $x = 0$  and  $x = 2$
  - (e)  $x = -2$ ,  $x = 0$  and  $x = 2$
-

59. Find the linear approximation of  $y = 2x^3 - 3x^2 + 2x$  at  $x = 1$ .

- (a)  $L(x) = -1$
  - (b)  $L(x) = -x + 1$
  - (c)  $L(x) = 2x - 2$
  - (d)  $L(x) = 2x - 1$
  - (e)  $L(x) = -2x + 3$
- 

60. Find the linear approximation of  $y = 2x \cos x$  at  $x = \pi$ .

- (a)  $L(x) = -2x$
  - (b)  $L(x) = 2x - 4\pi$
  - (c)  $L(x) = -2x + 4\pi$
  - (d)  $L(x) = 2x - \pi$
  - (e)  $L(x) = -2\pi x$
- 

61. Find the absolute minimum value of the function  $y = 2x^3 - 9x^2 + 12x + 4$  on the interval  $[0, 3]$ .

- (a)  $-12$
  - (b)  $0$
  - (c)  $4$
  - (d)  $13$
  - (e)  $8$
- 

62. Find the absolute maximum value of the function  $f(x) = x + \frac{1}{x}$  on the interval  $[\frac{1}{2}, 2]$ .

- (a)  $-\frac{5}{2}$
  - (b)  $0$
  - (c)  $1$
  - (d)  $-1$
  - (e)  $\frac{5}{2}$
- 

63. How many inflection points does the graph of  $y = x^6 - 6x^5 + 10x^4 - 8x + 5$  have?

- (a)  $0$
  - (b)  $1$
  - (c)  $2$
  - (d)  $3$
  - (e)  $4$
-

64. How many inflection points does the graph of  $y = 2x^6 - 3x^5 - 10x^4 + 5x$  have?

- (a) 0
  - (b) 1
  - (c) 2
  - (d) 3
  - (e) 4
- 

65. Which of the following is an antiderivative of  $6x^2 + 1 + 3\sin x - 2\sec^2 x$ ?

- (a)  $x^3 + x - \cos x - \tan x + C$
  - (b)  $2x^3 + x - 3\cos x - 2\tan x + C$
  - (c)  $2x^3 + x + 3\cos x - 2\cot x + C$
  - (d)  $6x^3 + x - 3\sin x - 2\tan x + C$
  - (e)  $2x^3 + x - 3\cos x + 6\tan x + C$
- 

66. Which of the following is an antiderivative of  $6\sin 2x - 9\cos 3x$ ?

- (a)  $3\cos 2x + \sin 3x + C$
  - (b)  $-\cos 2x - \sin 3x + C$
  - (c)  $-3\cos 2x - 3\sin 3x + C$
  - (d)  $2\cos 2x - 3\sin 3x + C$
  - (e)  $-3\cos 2x + 2\sin 3x + C$
- 

67. Which of the following is equal to the area under the curve  $y = |x - 4|$  between  $x = 0$  and  $x = 6$ ?

- (a)  $\int_0^6 (x - 4)dx$
  - (b)  $-\int_0^6 (x - 4)dx$
  - (c)  $\int_4^6 (x - 4)dx$
  - (d)  $\int_0^4 (x - 4)dx + \int_4^6 (4 - x)dx$
  - (e)  $\int_0^4 (4 - x)dx + \int_4^6 (x - 4)dx$
- 

68. Find the area of the region bounded by the graphs of  $f(x) = 9 - (x - 3)^2$  and  $g(x) = x$ .

- (a)  $-\frac{125}{6}$
  - (b)  $-5$
  - (c)  $\frac{125}{6}$
  - (d) 5
  - (e)  $\frac{4}{3}$
-

69. Find the area of the region bounded by the graphs of  $f(x) = 4 - x^2$  and  $g(x) = 2 - x$ .
- (a)  $\frac{19}{2}$
  - (b) 9
  - (c)  $\frac{9}{2}$
  - (d) 7
  - (e)  $\frac{3}{2}$
- 

70. If  $f(x) = 2x^2 - 3x + 1$  then  $\lim_{x \rightarrow 2} \frac{f(x) - f(2)}{x - 2} =$ .
- (a) 5
  - (b) 3
  - (c)  $\infty$
  - (d) undefined
  - (e) 2
- 

71. If  $f(x) = 2\sqrt{3x+1}$  then  $\lim_{x \rightarrow 2} \frac{f(x) - f(1)}{x - 1} =$ .
- (a)  $\infty$
  - (b)  $\frac{3}{2}$
  - (c)  $\frac{2}{3}$
  - (d)  $-\infty$
  - (e) 0
- 

72. The domain of the function  $f(x) = \sqrt{\frac{2}{x-3}}$  is
- (a)  $x = 3$
  - (b)  $x \neq 0$
  - (c)  $x \neq 3$
  - (d)  $x \geq 3$
  - (e)  $x > 3$
- 

73. The domain of the function  $f(x) = \frac{x+1}{x\sqrt{x^2+1}}$  is
- (a)  $x \neq 0$
  - (b)  $x \geq 0$
  - (c)  $x > 0$
  - (d)  $x \neq -1$
  - (e)  $x \geq -1$
-

74. Find  $f \circ g$  if  $f(x) = \frac{x}{x+1}$  and  $g(x) = x - 1$ .

- (a)  $\frac{-1}{x+2}$
  - (b)  $\frac{x-1}{x}$
  - (c)  $\frac{x+1}{x-1}$
  - (d)  $\frac{x}{x+1}$
  - (e)  $\frac{x}{x+1} - 1$
- 

75. Find  $f \circ g$  if  $f(x) = \frac{x^2}{x+1}$  and  $g(x) = x + 1$ .

- (a)  $\frac{x^2}{x+1} + 1$
  - (b)  $\frac{(x+1)^2}{x}$
  - (c)  $\frac{x+1}{x+2}$
  - (d)  $\frac{(x+1)^2}{x+2}$
  - (e)  $\frac{(x+1)^2}{x+2} + 1$
- 

76. Let  $f(x) = x^4$  and  $g(x) = \sqrt{x}$ . Find the domain of  $f \circ g$ .

- (a)  $(-\infty, \infty)$
  - (b)  $(0, \infty)$
  - (c)  $[0, \infty)$
  - (d)  $(-\infty, 0) \cup (0, \infty)$
  - (e)  $\{0\}$
- 

77. Let  $f(x) = \frac{x}{x-1}$  and  $g(x) = \sqrt{x+1}$ . Find the domain of  $f \circ g$ .

- (a)  $x \neq 0$
  - (b)  $x \geq -1$
  - (c)  $x > -1$
  - (d)  $x \leq -1$  and  $x > 0$
  - (e)  $x \geq -1, x \neq 0$
-

78. Let  $\mathcal{R}$  be the region enclosed by the curves  $y = \frac{1}{2}x + \frac{1}{2}$  and  $y = \sqrt{x+1}$ . Find the volume of the solid formed by rotating  $\mathcal{R}$  about the  $x$ -axis.

(a)  $2\pi \int_{-1}^3 \left( \sqrt{x+1} - \frac{1}{2}x - \frac{1}{2} \right) dx$

(b)  $\pi \int_{-1}^3 \left( \sqrt{x+1} - \frac{1}{2}x - \frac{1}{2} \right) dx$

(c)  $\pi \int_0^1 \left( (\sqrt{x+1})^2 - \left( \frac{1}{2}x + \frac{1}{2} \right)^2 \right) dx$

(d)  $\pi \int_{-1}^3 \left( \sqrt{x+1} - \frac{1}{2}x - \frac{1}{2} \right)^2 dx$

(e)  $2\pi \int_0^1 \left( \sqrt{x+1} - \frac{1}{2}x - \frac{1}{2} \right)^2 dx$

---

79. Let  $\mathcal{R}$  be the region enclosed by the curve  $y = 4 - x^2$  and the  $x$  axis. Find the volume of the solid formed by rotating  $\mathcal{R}$  about the  $x$ -axis.

(a)  $\int_{-2}^2 2\pi(4 - x^2) dx$

(b)  $\int_{-2}^2 \pi(4 - x^2)^2 dx$

(c)  $\int_{-2}^2 \pi(4 - x^2) dx$

(d)  $\int_{-2}^2 (4 - x^2) dx$

(e)  $\int_{-2}^2 (4 - x^2)^2 dx$

---

80. A particle moves along a straight line with equation of motion  $s(t) = 6\sqrt{t^2 + 5}$ . Find its velocity at  $t = 2$ .

(a) 2

(b) 3

(c) 6

(d) 5

(e) 4

---

81. A particle moves along a straight line with velocity  $v(t) = \frac{3}{2\sqrt{3t+1}}$ . Find its position at  $t = 1$  if  $s(0) = 2$ .

(a) 2

(b) 3

(c) 6

(d) 5

(e) 4

---

82. Let  $y(x) = x^2 \cos(2x + 1)$ . Find  $y'(x)$ .

- (a)  $2x \sin(2x + 1)$
- (b)  $2x \cos(2x + 1) - 2x^2 \sin(2x + 1)$
- (c)  $\sin(2x + 1) + x \cos(2x + 1)$
- (d)  $x \sin(2x + 1) + \cos(2x + 1)$
- (e)  $2x \cos 2$

---

83. Let  $f(x) = \sin x \cos(2x)$ . Find  $f'(x)$ .

- (a)  $2 \cos(2x) \cos x - \sin(2x) \sin x$
- (b)  $-2 \cos(2x) \cos x + 2 \sin(2x) \sin x$
- (c)  $\cos(2x) \sin x - 2 \sin(2x) \cos x$
- (d)  $\cos(2x) \cos x - 2 \sin(2x) \sin x$
- (e)  $2 \cos(2x) \sin x - 2 \sin(2x) \sin x$

---

84. A spherical balloon is losing helium at the rate of  $360\pi$  cubic meters a minute. How is the radius changing when the volume is  $36000\pi$  cubic meters?  $V = \frac{4}{3} \pi r^3$

- (a)  $-.01$  m/min
- (b)  $.1$  m/min
- (c)  $.01$  m/min
- (d)  $-.1$  m/min
- (e)  $-1$  m/min

---

85. If  $x^2 + 2y^2 = 18$  and  $\frac{dy}{dt} = 8$ , find  $\frac{dx}{dt}$  when  $y = 1$ .

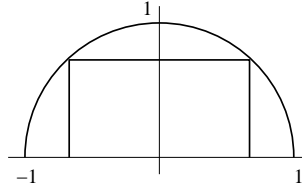
- (a)  $\frac{dx}{dt} = -8$
- (b)  $\frac{dx}{dt} = -4$
- (c)  $\frac{dx}{dt} = 8$
- (d)  $\frac{dx}{dt} = -2$
- (e)  $\frac{dx}{dt} = -3$

---

86. A cylindrical tank with radius  $r = 3$  is being filled at the rate of  $18\pi$  cubic feet per minute. How fast is the depth changing when the depth is 5 feet?

- (a)  $9\pi$  feet per minute
  - (b) 6 feet per minute
  - (c) 2 feet per minute
  - (d)  $6\pi$  feet per minute
  - (e) 4 feet per minute
-

87. Find the height of the rectangle enclosing the largest possible area that can be inscribed in a semicircle of radius 1 as pictured.



- (a)  $\frac{1}{2}$   
(b)  $\frac{3}{4}$   
(c)  $\frac{1}{\sqrt{3}}$   
(d)  $\frac{1}{\sqrt{2}}$   
(e)  $\frac{\sqrt{3}}{2}$
- 
88. I am constructing a pen for my many pet badgers. I want 7 compartments each with sides parallel to one side of the enclosure. I have 640 meters of fence. What are the dimensions of the pen that maximize the total area of the enclosure?

- (a) length=160 meters and width=160 meters  
(b) length=40 meters and width=160 meters  
(c) length=80 meters and width=160 meters  
(d) length=80 meters and width=120 meters  
(e) length=40 meters and width=60 meters

- 
89. Find the negative number that minimizes  $A(x) = \frac{8}{x} - 2x$ .

- (a)  $-\frac{1}{2}$   
(b)  $-2$   
(c)  $-3$   
(d) there is no minimum  
(e)  $-\frac{5}{2}$

- 
90. Find the point on the line  $y = 2x + 5$  that is closest to the origin.

- (a)  $(-2, 1)$   
(b)  $(2, 9)$   
(c)  $(0, 5)$   
(d)  $(-2, 5)$   
(e)  $(-3, -1)$

- 
91. The inflection points of  $f(x) = 3x^5 - 40x^3 + 3x + 1$  are

- (a)  $(-2, 219)$  and  $(2, -217)$   
(b)  $(0, 1)$   
(c)  $(-2, 219)$ ,  $(2, -217)$ , and  $(0, 1)$   
(d)  $(2, -217)$   
(e)  $(0, )$  and  $(2, -217)$

---

92. The graph of  $f(x) = 3x^5 - 40x^3 + 3x + 1$  is concave down on

- (a)  $(-\infty, -2) \cup (2, \infty)$
- (b)  $(-\infty, -2) \cup (0, 2)$
- (c)  $(0, 2)$
- (d)  $(-2, 0) \cup (0, 2)$
- (e)  $(-\infty, -2)$

---

93. The function  $f(x) = 3x^5 - 20x^3 + 30$  is increasing on

- (a)  $(-\infty, -2) \cup (0, 2)$
- (b)  $(0, 2)$
- (c)  $(-2, 0) \cup (0, 2)$
- (d)  $(-\infty, -2) \cup (2, \infty)$
- (e)  $(-2, 0) \cup (0, 2)$

---

94. The slope of the tangent line to the graph of  $f(x) = x - \frac{8}{x}$  at  $x = -2$  is

- (a) 3
- (b) -1
- (c) -3
- (d) 1
- (e) 5

---

95. The slope of the tangent line to the graph of  $f(x) = 2x - \frac{16}{\sqrt{x}}$  at  $x = 4$  is

- (a) -1
- (b) 3
- (c) -4
- (d) 2
- (e) 5

---

96. What can be said about the roots of the equation  $x^3 + 3x + 1 = 0$ ?

- (a) it has no real roots
  - (b) it has exactly 1 real root which is between -2 and -1
  - (c) it has exactly 1 real root which is between -1 and 0
  - (d) it has exactly 1 real root which is between 0 and 2
  - (e) it has 3 real roots
-

97. How many roots does the equation  $x^5 + 2x^3 + 3x - 2 = 0$  have?

- (a) 0
  - (b) 1
  - (c) 2
  - (d) 3
  - (e) 4
- 

98. For  $f(x) = x^2 - 3x + 1$  find all points on  $[0, 2]$  that satisfy the conclusion of the Mean Value Theorem.

- (a)  $x = 0$
  - (b)  $x = -2$
  - (c)  $x = 1$
  - (d)  $x = 2$
  - (e)  $x = 3$
- 

99. For  $f(x) = 2x^3 - 3x^2 - 12x + 5$  find all points on  $[0, 3]$  that satisfy the conclusion of Rolle's Theorem.

- (a)  $x = 2$
  - (b)  $x = 1$  and  $x = 2$
  - (c)  $x = 1$
  - (d)  $x = -1$  and  $x = 2$
  - (e)  $x = \frac{1}{2}$
- 

100.  $f(x) = x^4 - 5x^2$  has local maxima at

- (a)  $x = \frac{5}{2}$
  - (b)  $x = 0$  and  $\frac{5}{2}$
  - (c)  $x = 0$
  - (d)  $x = 0$  and  $-\frac{5}{2}$
  - (e) no local maxima
- 

101.  $f(x)$  has derivative  $f'(x) = x^2(x+2)(x-5)(x-2)^2$ .  $f(x)$  has local minima at

- (a)  $x = -2$  and  $x = 5$
  - (b)  $x = 0$
  - (c)  $x = 0$  and  $x = 5$
  - (d)  $x = -2$  and  $x = 0$
  - (e)  $x = 5$
-

102.  $f(x)$  has derivative  $f'(x) = x^2(x+2)(x-5)(x-2)$ .  $f(x)$  has local minima at
- (a)  $x = -2$  and  $x = 5$
  - (b)  $x = 0$
  - (c)  $x = 0$  and  $x = 5$
  - (d)  $x = -2$  and  $x = 0$
  - (e)  $x = 5$
- 

103.  $\int_1^2 (6x^2 - 2x - 1) dx =$
- (a) 8
  - (b) 12
  - (c) 10
  - (d) 16
  - (e) 6
- 

104.  $\int_{-1}^2 (3x^2 - 4x + 2) dx =$
- (a) 3
  - (b) 5
  - (c) 9
  - (d) 10
  - (e) 11
- 

105.  $\int_1^2 \left( \frac{8}{x^3} + 2x \right) dx =$
- (a) 2
  - (b) 3
  - (c) 4
  - (d) 6
  - (e) 7
- 

106.  $\int_0^{\frac{\pi}{2}} (2 \sin x - \cos x) dx =$
- (a)  $\pi$
  - (b) 0
  - (c) 2
  - (d)  $2\pi$
  - (e) 1
-

107. If  $f(x) = 2x^2 - 3x + 1$  then  $\lim_{h \rightarrow 0} \frac{f(2+h) - f(2)}{h} =$ .
- (a) 5
  - (b) 3
  - (c)  $\infty$
  - (d) undefined
  - (e) 2
- 

108. If  $g(x) = \int_x^3 t^2 \sin t \, dt$  then
- (a)  $g'(x) = -2x \sin x$
  - (b)  $g'(x) = 2x^2 \sin x$
  - (c)  $g'(x) = -x^2 \sin x$
  - (d)  $g'(x) = -x^2 \cos x + 2x \sin x$
  - (e)  $g'(x) = -2x \cos x$
- 

109. If  $g(x) = \int_2^x t \cos t \, dt$  then
- (a)  $g'(x) = -x \sin x + \cos x$
  - (b)  $g'(x) = x \cos x$
  - (c)  $g'(x) = \cos x + \sin x$
  - (d)  $g'(x) = \sin x$
  - (e)  $g'(x) = x \sin x$
- 

110. If  $g(x) = \int_2^x t \cos t \, dt$  find  $\frac{d^2y}{dx^2}$
- (a)  $t \cos t$
  - (b)  $x \sin x$
  - (c)  $x^2 \sin x$
  - (d)  $\cos x - x \sin x$
  - (e)  $\sin x$
- 

111. If  $f(x) = \int_2^{x^2-1} t \cos t \, dt$  then
- (a)  $2x(x^2 - 1) \cos(x^2 - 1)$
  - (b)  $x \cos(x^2 - 1)$
  - (c)  $2x \cos(x^2 - 1)$
  - (d)  $2x(x^2 - 1) \cos x$
  - (e)  $2(x^2 - 1) \cos x$
-