MATH 75 - Practice Final - Spring 2005

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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) $4x^3 - 2x^2 + 3$

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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) $3x^{\frac{1}{2}} + 5x^{-\frac{1}{2}}$

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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) $4x^3 - 3x^2$

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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) $4x^4 - 2x^2 + x + 1$

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5. Find $f'(1)$ if $f(x) = \dfrac{3x^2 - 2}{x^2 - x + 2}$.
   (a) 11/4
   (b) −11/6
   (c) −11/4
   (d) 11/3
   (e) 11/6

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

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

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

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

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

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

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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) $f'(x) = (3x^2-2)(x^3-2x+3)^5$

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

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

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11. If $f(x) = (x^2 - 2x)^2 (x+2)^3$ find $f'(1)$.

(a) 27

(b) 5

(c) -6

(d) 10

(e) 20

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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) $\cos x + \sec^2 x + 1$

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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) $-2\sin x + \csc x \cot x - x \sin x$

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14. Find $f'(x)$ if $f(x) = \tan^2 x + \dfrac{1}{1-\sin x}$.

(a) $2\tan x \csc^2 x + \dfrac{\cos x}{(1+\sin x)^3}$

(b) $2\tan x \sec^2 x + \dfrac{\cos x}{(1-\sin x)^2}$

(c) $\tan x \sec^2 x + \dfrac{\cos x}{1-\sin x}$

(d) $\dfrac{\cos x}{(1-\sin x)^2}$

(e) $2\tan x \sec^2 x$

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15. Find y' if $y = \dfrac{3\cos x}{\sin x}$.

(a) $y' = \csc^2 x$

(b) $y' = -3\sin^2 x$

(c) $y' = 3\cot^2 x$

(d) $y' = \csc^3 x$

(e) $y' = -3\csc^2 x$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(b) 1

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

(d) 0

(e) 3

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

(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) $-\dfrac{3}{\sqrt{1-2\,x}}$

(b) $3\,(1-2x)^{\frac{3}{2}}$

(c) $\dfrac{1}{\sqrt{1-2\,x}}$

(d) $6\,(1-2x)^{\frac{1}{2}}$

(e) $\dfrac{3\,x}{\sqrt{1-2\,x}}$

---

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

(a) -3

(b) $\frac{1}{16}$

(c) 3

(d) 6

(e) -6

---

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

(a) $\dfrac{4}{(1-4\,x)^{\frac{1}{2}}}$

(b) $-\dfrac{4}{(1-4\,x)^{\frac{3}{2}}}$

(c) $\dfrac{6}{(1-4\,x)^{\frac{3}{2}}}$

(d) $-\dfrac{4}{(1-4\,x)^{\frac{1}{2}}}$

(e) $\dfrac{-4\,x}{(1-4\,x)^{\frac{3}{2}}}$

---

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

(a) $3\,x^3-4\,x^2+x+C$

(b) $6\,x-4+C$

(c) $x^3-2\,x^2+C$

(d) $x^3-2\,x^2+x+C$

(e) $x^3+4\,x^2+x+C$

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25. $\int \left(\pi + 4\,x - 25\,x^{4} \right)\, dx =$

(a) $x + 2\,x^{2} - 25\,x^{5} + C$

(b) $\pi + 4\,x^{2} - 5\,x^{5} + C$

(c) $\pi\,x + 4\,x^{2} - 25\,x^{5} + C$

(d) $\pi\,x + 2\,x^{2} - 5\,x^{5} + C$

(e) $\pi\,x - 2\,x^{3} - 5\,x^{5} + C$

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26. $\int \left(\frac{1}{x^{4}} + \frac{1}{\sqrt{x}} \right)\, dx =$

(a) $\frac{2}{3\,x^{3}} + 2\,\sqrt{x}$

(b) $-\frac{1}{x^{2}} + 2\,\sqrt{x}$

(c) $-\frac{1}{3\,x^{3}} + 2\,\sqrt{x}$

(d) $\frac{1}{3\,x^{3}} + \sqrt{x}$

(e) $-\frac{1}{3\,x^{5}} - 2\,\sqrt{x}$

---

27. $\int \left(\sin x + 4\,\cos 2\,x \right)\, dx =$

(a) $-\cos x + 4\,\sin 2\,x + C$

(b) $\cos x - 4\,\sin 2\,x + C$

(c) $\cos x - 2\,\sin 2\,x + C$

(d) $-\cos x - 4\,\sin 2\,x + C$

(e) $-\cos x + 2\,\sin 2\,x + C$

---

28. $\int \left(3\sec^{2} x + \csc x\,\cot x \right)\, dx =$

(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) $3\,\tan x - \csc x + C$

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29. $\int \sin\left(3\,x \right)\, dx =$

(a) $\frac{1}{3}\,\sin(3\,x) + C$

(b) $\sin 3 + C$

(c) $\cos(\,3\,x\,) + C$

(d) $\cos(3\,x) + C$

(e) $-\frac{1}{3}\,\cos(3\,x) + C$

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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) $\sin(5x+1)+C$

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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) $2\sec x\tan x+C$

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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) $\pi\sec x-\pi\cot x+C$

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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) $\sin^2 x\cos^3 x+C$

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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) $2\tan^5 x+C$

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35. $\int 9x\left(x^2-5\right)^2\,dx =$

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

(b) $\frac{\left(x^3-5\right)^3}{3}+C$

(c) $\left(x^3-5\right)^3+C$

(d) $18x\left(3x^2-5\right)^3+C$

(e) $18\left(x^3-5\right)+C$

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

(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. $\int \frac{4x-10}{\left(x^2-5x\right)^3}\,dx =$

(a) $-\frac{2x}{\left(x^2-5x\right)^2}+C$

(b) $-\frac{1}{\left(x^2-5x\right)^2}+C$

(c) $\frac{4}{\left(x^2-5x\right)^2}+C$

(d) $\frac{2}{\left(x^2-5x\right)^2}+C$

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

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38. Find $f'(2)$ if $f(x)=\frac{1}{\left(x^2-3\right)^3}$.

(a) -12

(b) $-\frac{4}{3}$

(c) 12

(d) $-\frac{1}{12}$

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

---

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

(a) -5

(b) 7

(c) -3

(d) 6

(e) -6

---

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

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

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42. Compute $\lim\limits_{x \to -4} \dfrac{x^2 + x - 12}{x^2 + 6x + 8}$.

(a) $\frac{7}{2}$

(b) 1

(c) $\frac{5}{6}$

(d) ∞

(e) $-\infty$

---

43. Compute $\lim\limits_{x \to -\infty} \dfrac{1 - 3x}{\sqrt{x^2 - 4}}$.

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

(b) 3

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

(d) -3

(e) $\frac{3}{\sqrt{2}}$

---

44. Compute $\lim_{x \to -3} \dfrac{x^2 - x - 6}{x^2 + 9}$.

(a) ∞

(b) $\frac{1}{6}$

(c) $-\infty$

(d) $\frac{1}{3}$

(e) 6

---

45. Compute $\lim_{x \to -3} \dfrac{x^2 + x - 6}{x + 9}$.

(a) ∞

(b) $\frac{1}{6}$

(c) $-\infty$

(d) $\frac{1}{3}$

(e) 0

---

46. Compute $\lim_{x \to 2} \left(x^3 - 3x^2 + 6x + 2 \right)$.

(a) 10

(b) 18

(c) 8

(d) -4

(e) -10

---

47. Compute $\lim_{x \to -1} \left(x^3 - 3x^2 + 6x + 2 \right)^2$.

(a) ∞

(b) 64

(c) $-\infty$

(d) Does not exist

(e) 0

---

48. Evaluate $\lim_{x \to 6} \dfrac{\sqrt{x + 10} - 4}{x - 6}$.

(a) 0

(b) $\frac{1}{8}$

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

(d) $\frac{1}{6}$

(e) ∞

---

49. Evaluate $\lim_{x\to 0} \dfrac{10-\sqrt{x+100}}{x}$.

(a) ∞

(b) $-\infty$

(c) $-\frac{1}{10}$

(d) $-\frac{1}{20}$

(e) 0

---

50. Evaluate $\lim_{x\to 0} \dfrac{x}{7-\sqrt{x+49}}$.

(a) -14

(b) 14

(c) 7

(d) ∞

(e) Does not exist

---

51. Compute $\lim_{x\to\infty} \dfrac{5\,x^3-5\,x^2+5}{3-2\,x^3}$.

(a) $-\infty$

(b) ∞

(c) $\frac{2}{5}$

(d) 0

(e) $-\frac{5}{2}$

---

52. Compute $\lim_{x\to\infty} \dfrac{5\,x^3-5\,x^2+5}{3\,x-2\,x^4}$.

(a) $-\infty$

(b) ∞

(c) $\frac{2}{5}$

(d) 0

(e) $\frac{5}{2}$

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53. Find the vertical asymptotes for the graph of the function $f(x)=\dfrac{x^2+3x+2}{x^2-1}$.

(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 $f(x) = \dfrac{6x^2 + 5x - 3}{x^2 + 2x + 1}$.

(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 $2\,y + y^{\,2} - 2\,x^{\,2} = y\,x^{\,2}$ at the point $(\,2\,,\,4\,)$.

(a) 4

(b) $-\frac{1}{4}$

(c) 0

(d) $\frac{4}{3}$

(e) 16

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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) π

(c) 1

(d) $1 - \pi$

(e) 2

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57. How many local maxima does the graph of $y = 3 + \cos(\,2\,x\,)$ have?

(a) 0

(b) 1

(c) 2

(d) 3

(e) infinitely many

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58. $y = 2\,x^{\,6} - 12\,x^{\,4} + 1$ 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 $x = 2$

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

(a) $L(x) = -1$

(b) $L(x) = -x + 1$

(c) $L(x) = 2\,x - 2$

(d) $L(x) = 2\,x - 1$

(e) $L(x) = -2\,x + 3$

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

(a) $L(x) = -2\,x$

(b) $L(x) = 2\,x - 4\,\pi$

(c) $L(x) = -2\,x + 4\,\pi$

(d) $L(x) = 2\,x - \pi$

(e) $L(x) = -2\,\pi\,x$

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

(a) -12

(b) 0

(c) 4

(d) 13

(e) 8

---

62. Find the absolute maximum value of the function $f(x) = x + \dfrac{1}{x}$ 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 $y = x^6 - 6\,x^5 + 10\,x^4 - 8\,x + 5$ have?

(a) 0

(b) 1

(c) 2

(d) 3

(e) 4

---

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

(a) 0

(b) 1

(c) 2

(d) 3

(e) 4

---

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

(a) $x^{\,3} + x - \cos x - \tan x + C$

(b) $2\,x^{\,3} + x - 3\,\cos x - 2\,\tan x + C$

(c) $2\,x^{\,3} + x + 3\,\cos x - 2\,\cot x + C$

(d) $6\,x^{\,3} + x - 3\,\sin x - 2\,\tan x + C$

(e) $2\,x^{\,3} + x - 3\,\cos x + 6\tan x + C$

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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) $\displaystyle\int_0^6 (x-4)dx$

(b) $\displaystyle -\int_0^6 (x-4)dx$

(c) $\displaystyle\int_4^6 (x-4)dx$

(d) $\displaystyle\int_0^4 (x-4)dx + \int_4^6 (4-x)dx$

(e) $\displaystyle\int_0^4 (4-x)dx + \int_4^6 (x-4)dx$

---

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 $\lim_{x \to 2} \frac{f(x) - f(2)}{x - 2} =$

(a) 5

(b) 3

(c) ∞

(d) undefined

(e) 2

---

71. If $f(x) = 2\sqrt{3x + 1}$ then $\lim_{x \to 2} \frac{f(x) - f(1)}{x - 1} =$

(a) ∞

(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 $f(x) = \dfrac{x}{x+1}$ 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) $\frac{x}{x+1} - 1$

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

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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) $\{0\}$

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77. Let $f(x) = \dfrac{x}{x-1}$ 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) $x \geq -1$, $x \neq 0$

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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) $\pi \int_{0}^{1} \left(\left(\sqrt{x+1}\right)^2 - \left(\frac{1}{2}x + \frac{1}{2} \right)^2 \right) dx$

(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 $v(t) = \frac{3}{2\sqrt{3\,t+1}}$. 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 360π cubic meters a minute. How is the radius changing when the volume is 36000π cubic meters? Recall that $V = \frac{4}{3}\pi r^3$.

(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 $\dfrac{dy}{dt} = 8$, find $\dfrac{dx}{dt}$ when $y = 1$.

(a) $\dfrac{dx}{dt} = -8$

(b) $\dfrac{dx}{dt} = -4$

(c) $\dfrac{dx}{dt} = 8$

(d) $\dfrac{dx}{dt} = -2$

(e) $\dfrac{dx}{dt} = -3$

---

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

(a) 9π feet per minute

(b) 6 feet per minute

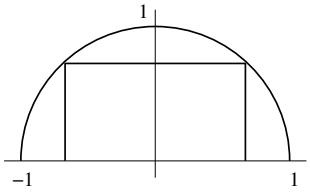
(c) 2 feet per minute

(d) 6π 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 such that all internal sides are parallel to each other and 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 x that minimizes $A(x) = \dfrac{8}{x} - 2\,x\,.$

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

---

90. Find the point on the line $y = 2\,x + 5$ 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 $f(x) = 3\,x^{\,5} - 40\,x^{\,3} + 3\,x + 1$ 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 $f(x) = 3\,x^5 - 40\,x^3 + 3\,x + 1$ is concave down on

(a) $(-\infty\,,\,-2\,)\bigcup(\,2\,,\,\infty\,)$

(b) $(-\infty\,,\,-2\,)\bigcup(\,0\,,\,2\,)$

(c) $(\,0\,,\,2\,)$

(d) $(-2\,,\,0\,)\bigcup(\,0\,,\,2\,)$

(e) $(-\infty\,,\,-2\,)$

---

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

(a) $(-\infty\,,\,-2\,)\bigcup(\,0\,,\,2\,)$

(b) $(\,0\,,\,2\,)$

(c) $(-2\,,\,0\,)\bigcup(\,0\,,\,2\,)$

(d) $(-\infty\,,\,-2\,)\bigcup(\,2\,,\,\infty\,)$

(e) $(-2\,,\,0\,)\bigcup(\,0\,,\,2\,)$

---

94. The slope of the tangent line to the graph of $f(x) = x - \dfrac{8}{x}$ 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 $f(x) = 2\,x - \dfrac{16}{\sqrt{x}}$ 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 $x^3 + 3\,x + 1 = 0$?

(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. $\displaystyle\int_1^2 \left(6x^2 - 2x - 1\right)\,dx =$

(a) 8

(b) 12

(c) 10

(d) 16

(e) 6

---

104. $\displaystyle\int_{-1}^2 \left(3x^2 - 4x + 2\right)\,dx =$

(a) 3

(b) 5

(c) 9

(d) 10

(e) 11

---

105. $\displaystyle\int_1^2 \left(\frac{8}{x^3} + 2x\right)\,dx =$

(a) 2

(b) 3

(c) 4

(d) 6

(e) 7

---

106. $\displaystyle\int_0^{\frac{\pi}{2}} (2\sin x - \cos x)\,dx =$

(a) π

(b) 0

(c) 2

(d) 2π

(e) 1

---

107. If $f(x) = 2\,x^2 - 3\,x + 1$ then $\lim_{h \to 0} \dfrac{f(2+h) - f(2)}{h} =$.

(a) 5

(b) 3

(c) ∞

(d) undefined

(e) 2

---

108. If $g(x) = \displaystyle\int_x^3 t^{\,2} \sin t \, dt$ then

(a) $g'(x) = -2\,x \sin x$

(b) $g'(x) = 2\,x^{\,2} \sin x$

(c) $g'(x) = -x^{\,2} \sin x$

(d) $g'(x) = -x^{\,2} \cos x + 2\,x \sin x$

(e) $g'(x) = -2\,x \cos x$

---

109. If $g(x) = \displaystyle\int_2^x t \cos t \, dt$ 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 $g(x) = \displaystyle\int_2^x t \cos t \, dt$ find $\dfrac{d^2y}{dx^2}$

(a) $t \cos t$

(b) $x \sin x$

(c) $x^{\,2} \sin x$

(d) $\cos x - x \sin x$

(e) $\sin x$

---

111. If $f(x) = \displaystyle\int_2^{x^{\,2}-1} t \cos t \, dt$ then

(a) $2\,x\,(\,x^{\,2} - 1\,)\cos(\,x^{\,2} - 1\,)$

(b) $x \cos(\,x^{\,2} - 1\,)$

(c) $2\,x \cos(\,x^{\,2} - 1\,)$

(d) $2\,x\,(\,x^{\,2} - 1\,)\cos x$

(e) $2(\,x^{\,2} - 1\,)\cos x$
