Math 1A

Final Exam - Review

Part 1: A calculator may not be used on this part of the exam.

1. $\lim_{x \to 0^+} \dfrac{2x+1}{x}$ is

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

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2. A particle moves in a straight line from its initial position so that after t seconds, its distance is given by $s(t) = \dfrac{t}{t+2}$ feet from its initial position. Find the instantaneous velocity of the particle at $t = 2$ seconds.

A) $\dfrac{3}{32}$ ft/sec B) $\dfrac{5}{8}$ ft/sec C) $\dfrac{1}{2}$ ft/sec D) $\dfrac{1}{8}$ ft/sec E) $\dfrac{1}{10}$ ft/sec

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3. $\dfrac{d}{dx}\left[\displaystyle\int_0^{x^2} \sin\left(t^3\right)\ dt\right] =$

A) $-\cos\left(x^6\right)$ B) $\sin\left(x^3\right)$ C) $\sin\left(x^6\right)$ D) $2x\sin\left(x^3\right)$ E) $2x\sin\left(x^6\right)$

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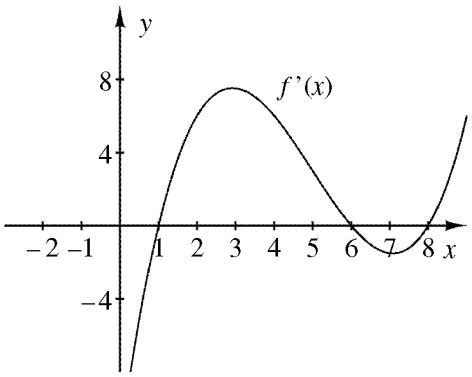
4. Find $\dfrac{d^2y}{dx^2}$ for $y = \dfrac{1-x}{x-3}$.

A) 0 B) $\dfrac{-8}{(x-3)^3}$ C) $\dfrac{-4}{(x-3)^3}$ D) $\dfrac{8}{(x-3)^3}$ E) $\dfrac{2}{(x-3)^2}$

5. The figure below is the graph of the derivative of the function $f(x)$. What interval(s) is $f(x)$ increasing?



A) $(-1, 6)$ B) $(-\infty, 2)$ or $(8, +\infty)$ C) $(8, +\infty)$

D) $(1, 6)$ or $(8, +\infty)$ E) $(-\infty, 1)$ or $(6, 8)$

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6. What is the slope of the line tangent to the curve $3y^2 - 2x^2 = 6 - 2xy$ at the point $(3,\ 2)$?

A) 0 B) $\frac{4}{9}$ C) $\frac{7}{9}$ D) $\frac{6}{7}$ E) $\frac{5}{3}$

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7. The figure shows the graph of f', the derivative of the function f. For what value(s) is the graph of f concave upwards?

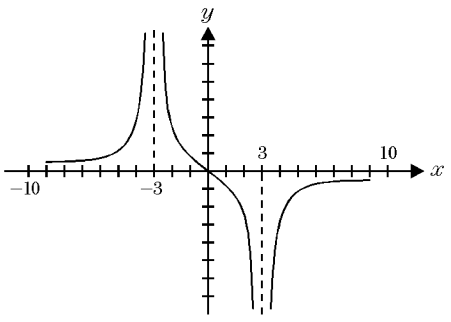
A) $-3 < x < 10$ only

B) $3 < x < +\infty$ only

C) $-3 < x < 3$ only

D) $-\infty < x < -3$ and $3 < x < +\infty$

E) $-3 < x < 0$ and $3 < x < +\infty$



8. Find the x-coordinate of the relative maximum or relative minimum point of the function $f(x) = x^{1/3}(9 - x)$.

A) $\frac{1}{4}$ maximizer B) $\frac{1}{4}$ minimizer C) $\frac{9}{4}$ minimizer

D) $\frac{9}{4}$ maximizer E) No extrema

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9. Integrate: $\int (2 + \sin 3t)^{\frac{1}{2}} \cos 3t \, \mathrm{dt}$

A) $-\frac{1}{2}(\cos 3t + 2)^{\frac{1}{2}} + C$ B) $\frac{2}{9}(\sin 3t + 2)^{\frac{3}{2}} + C$ C) $-\frac{1}{3}(\sin 3t + 2)^{\frac{1}{3}} + C$

D) $-\frac{1}{3}(\sin 3t + 2)^{\frac{3}{2}} + C$ E) $\frac{2}{9}(\cos 3t + 2)^{\frac{3}{2}} + C$

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10. An object moves along the x-axis so that its velocity at any time $t \geq 0$ is given by $v(t) = 4t^3 - 4t$. Find the total distance traveled for the particle from $t = 0$ to $t = 2$.

A) 0 B) 8 C) 9 D) 10 E) 12

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11. Find the given antiderivative: $\int (x + 1)\sqrt{x} \, dx$

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

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

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12. If $f(x) = \ln(\sin x)$, then $f''(x) =$

A) $\sin^2 x - 1$ B) $\sin^2 x + 1$ C) $-\cot^2 x - 1$ D) $-\cot^2 x + 1$ E) $\tan^2 x - 1$

13. $\int_{-5}^{5} \sqrt{25 - t^2}\,dt =$

A) $\frac{25}{2}\pi$ B) $\frac{25}{4}\pi$ C) 25π D) $\frac{5}{4}\pi$ E) $\frac{5}{2}\pi$

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14. Which Riemann Sum below would estimate the area under the curve for the function $f(x) = e^x$ from $a = 4$ to $b = 12$ using 20 equal subintervals and the midpoints of each subinterval.

A) $\sum_{i=1}^{20} f\left(4 + \left(i - \frac{1}{2}\right)\frac{2}{5}\right) \cdot \frac{2}{5}$

B) $\sum_{i=4}^{12} f\left(4 + (i-1)\frac{2}{5}\right) \cdot \frac{2}{5}$

C) $\sum_{i=1}^{20} f\left(4 + i \cdot \frac{2}{5}\right) \cdot \frac{2}{5}$

D) $\sum_{i=4}^{12} f\left(4 + \left(i - \frac{1}{2}\right)\frac{2}{5}\right) \cdot \frac{2}{5}$

E) $\sum_{i=1}^{20} f\left(4 + (i-1)\frac{2}{5}\right) \cdot \frac{2}{5}$

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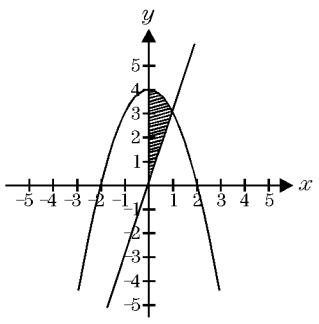
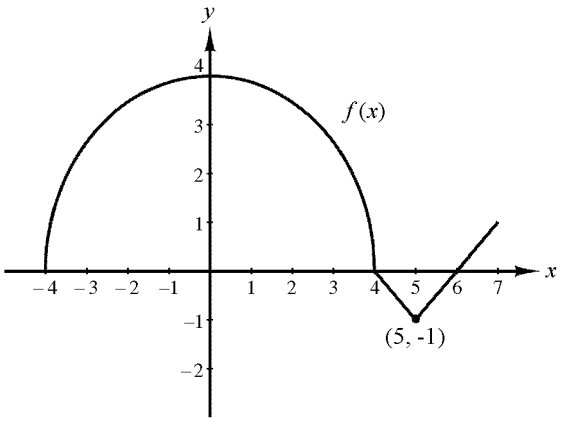
15. Let R be a region in the first quadrant enclosed by the curves of $y = 4 - x^2$, $y = 3x$, and the y-axis. Find the area of the enclosed region.

A) $\frac{6}{13}$ B) $\frac{1}{2}$ C) $\frac{13}{6}$ D) 4 E) 13



16. The graph below is the function f, it consists of two segments and a semicircle. Let g be the function given by $g(x) = \int_0^x f(t)\,dt$ and find $g(-4)$.



A) 4 B) $-\frac{\pi}{4}$ C) 4π D) $-\pi$ E) -4π

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17. Evaluate the indefinite integral: $\int \frac{x}{(x+2)^{2/3}}\,dx$

A) $\frac{3}{4}(x+2)^{1/3}(x+2)+C$

B) $\frac{3}{4}(x+2)^{2/3}+9(x+2)^{1/6}+C$

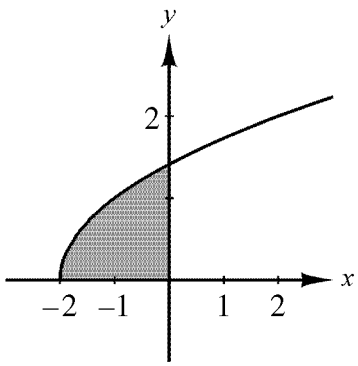
C) $3(x+2)^{1/3}+C$

D) $\frac{3}{4}(x+2)^{4/3}-6(x+2)^{1/3}+C$

E) $-\frac{1}{2}\ln(x+2)^{3/2}+C$

18. Find the volume of the solid formed by revolving $f(x) = (x+2)^{1/2}$ about the x-axis on the interval $[-2, 0]$.

A) $\frac{\pi}{3}$ B) $\frac{\pi}{2}$ C) π D) 2π E) 4π



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19. How many critical numbers does the graph of $y = \sin\left(\frac{1}{x}\right)$ have over $[-\pi/2,\ \pi/2]$?

A) Zero B) One C) Three

D) Five E) Cannot be determined

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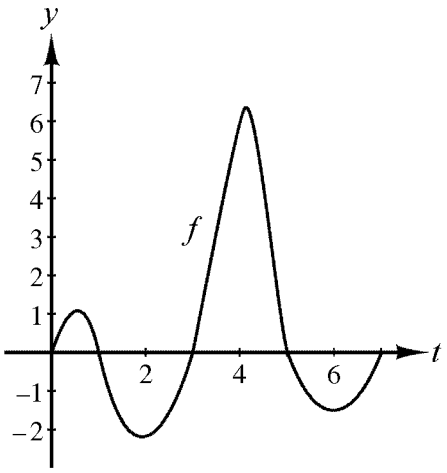
20. If $\frac{dy}{dx} = (1 + \ln x)y$ and if $y = 1$ when $x = 1$, then $y =$

A) $e^{(x^2-1)/x^2}$ B) $1 + \ln x$ C) $\ln x$ D) $e^{2x+x\ln x-2}$ E) $e^{x\ln x}$

21. Let $g(x) = \int_0^x f(t)dt$ in problems 22 and 23.

The graph of f is shown below.



At what x values do local **maximum** values of g occur?

A) $x = \frac{1}{2}$ and $x = 4$ B) $x = 1$ and $x = 5$ C) $x = 3$ and $x = 7$

D) $x = 2$ and $x = 6$ E) $x = 3$ and $x = 5$

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22. Approximately, on what intervals is g concave downward?

A) $(1,\ 3)$ and $(5,\ 7)$ B) $\left(0,\ \frac{1}{2}\right)$ and $(3,\ 4)$ C) $(3,\ 5)$

D) $(0,\ 1)$ and $(3,\ 5)$ E) $\left(\frac{1}{2},\ 2\right)$ and $(4,\ 6)$

23. When the region enclosed by graphs of $y = x$ and $y = 4x - x^2$ is revolved about the y-axis, the volume of the solid generated by is given by

A) $\pi \int_0^3 (x^3 - 3x^2)dx$

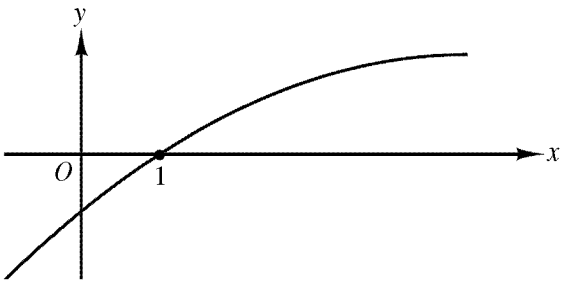
B) $\pi \int_0^3 (x^2 - (4x - x^2)^2)dx$

C) $\pi \int_0^3 (3x - x^2)^2 dx$

D) $2\pi \int_0^3 (x^3 - 3x^2)dx$

E) $2\pi \int_0^3 (3x^2 - x^3)dx$

24.



The graph of a twice-differentiable function f is shown in the figure above. Which of the following is true?

A) $f(1) < f'(1) < f''(1)$

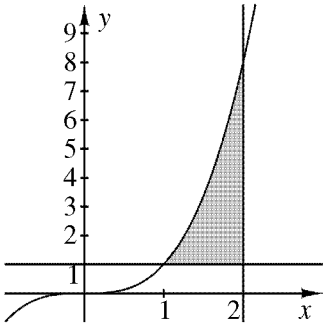
B) $f(1) < f''(1) < f'(1)$

C) $f'(1) < f(1) < f''(1)$

D) $f''(1) < f(1) < f'(1)$

E) $f''(1) < f'(1) < f(1)$

25. Which of the following integrals represents the volume of the solid formed by revolving the region bounded by $y = x^3$, $y = 1$, and $x = 2$ about the line $x = 2$? (See figure below.)



A) $2\pi \int_1^8 (3 - y)(\sqrt[3]{y} - 1)\, dy$

B) $\pi \int_1^2 \left[(x^3 - 1)^2 - 1^2\right]\, dx$

C) $\pi \int_1^8 \left[(\sqrt[3]{y})^2 - 1^2\right]\, dy$

D) $2\pi \int_1^2 (2 - x)(x^3 - 1)\, dx$

E) $\pi \int_1^2 \left[x^3 - 3\right]^2\, dx$

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1.
Answer: E

2.
Answer: D

3.
Answer: E

4.
Answer: C

5.
Answer: D

6.
Answer: B

7.
Answer: D

8.
Answer: D

9.
Answer: B

10.
Answer: D

11.
Answer: C

12.
Answer: C

13.
Answer: A

14.
Answer: A

15.
Answer: C

16.
Answer: E

17.
Answer: D

18.
Answer: D

19.
Answer: E

20.
Answer: E

21.
Answer: B

22.
Answer: E

23.
Answer: E

24.
Answer: D

25.
Answer: D