

Name: _____

DO NOT WRITE ON THIS EXAM BOOKLET

Directions: You have the entire class period to complete this exam. There are 10 multiple choice and 5 open response questions. When you have completed the exam, hand in the following materials: Exam booklet and scrap paper. If you finish early, you may leave, but please do so in a quiet manner. **GOOD LUCK!**

Day 1

Part 1 - Multiple Choice Questions

1. At how many locations does the function $f(x) = x^5 - 2$ have a slope of 5?

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

2. If $f'(x) = x^3 + 4x$ and $f(0) = 4$, then $f(x) = (?)$

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

3. For what values of x is the graph of $y = x^3 - 3x + 2$, concave upward?

- (a) $x > 0$
- (b) $x < -2$
- (c) $-2 < x < -1$
- (d) $-1 < x < 0$
- (e) all values of x

4. $\int_1^3 x^{-2} dx = (?)$

(a) $-\frac{26}{27}$

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

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

(d) $\frac{52}{27}$

(e) $\frac{26}{9}$

5. Let $f(x) = \sin(x) - \frac{1}{2}$. The maximum value reached by $f(x)$ is $= (?)$

(a) $\frac{1}{2}$

(b) 1

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

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

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

6. What are all the values of n for which the integration formula $\int u^n du = \frac{u^{n+1}}{n+1} + C$ is valid?

(a) $n \neq 0$

(b) $n \neq -1$

(c) $n > -1$

(d) $n > 0$

(e) All n

7. If $f(x) = \ln x^n$, then $f(e) = ?$

(a) $\frac{1}{e^n}$

(b) e^n

(c) $\frac{n}{e}$

(d) ne

(e) n

8. If $y = \cos^2(x)\sin(x)$ then $\frac{dy}{dx} = (?)$

(a) $\cos(x)[\cos^2(x) - 2\sin^2(x)]$

(b) $\cos^3(x) - 2\sin^2(x)$

(c) $\cos^2(x) + 2\sin^2(x)$

(d) $\cos^3(x) + 2\sin^2(x)$

(e) $\cos^2(x) - 2\sin^2(x)$

9. $\lim_{h \rightarrow 0} \frac{(x+h)^3 - x^3}{h} = ?$

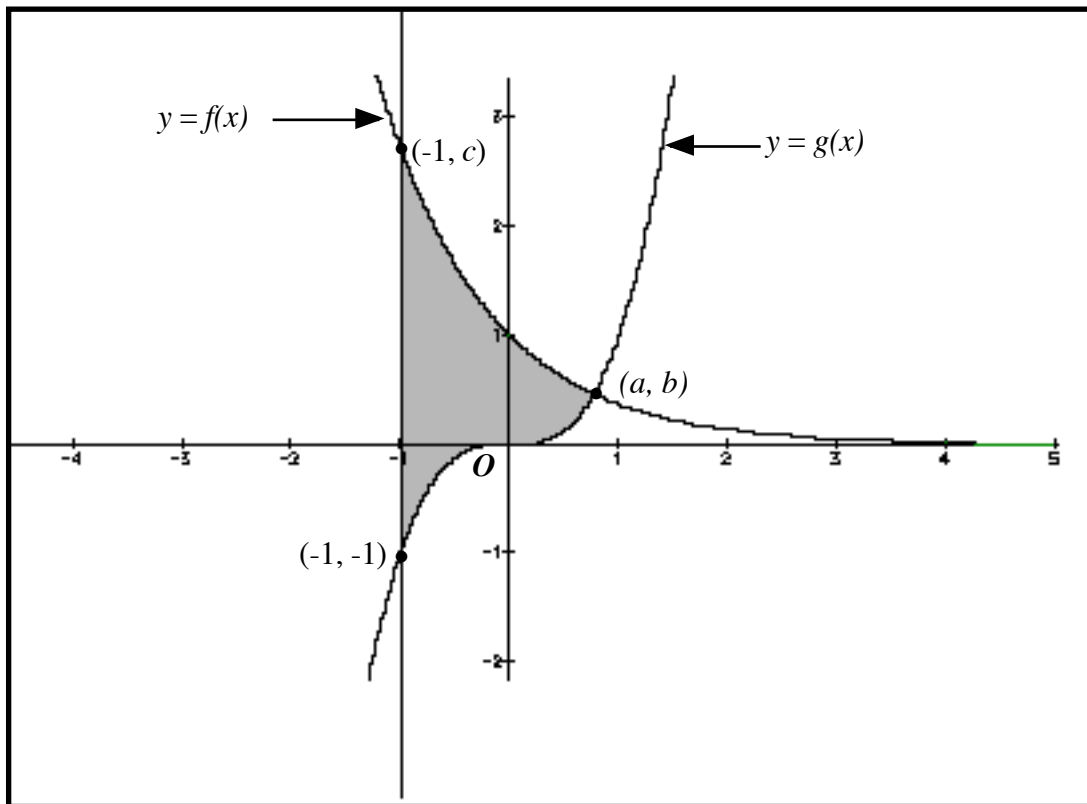
(a) x^3

(b) $3x^2$

(c) 0

(d) ∞

(e) -3



15. The curves $y = f(x)$ and $y = g(x)$ shown in the figure above intersect at the point (a, b) . The area of the shaded region enclosed by these curves and the line $x = -1$ is given

$$(a) \int_0^a (f(x) - g(x)) dx + \int_{-1}^0 (f(x) + g(x)) dx$$

$$(b) \int_{-1}^b g(x) dx + \int_b^c f(x) dx$$

$$(c) \int_{-1}^c (f(x) - g(x)) dx$$

$$(d) \int_{-1}^a (f(x) - g(x)) dx$$

$$(e) \int_{-1}^a (|f(x)| - |g(x)|) dx$$

Part 2 - Open Response Questions

11. What is the minimum value of the function, $y = x^2 - 5x + 4$?

12. What is the slope of the curve $y = x^3 - 3x^2 - 9x + 20$ at its inflection point?

13. $\lim_{x \rightarrow 3} \frac{2x - 6}{x^2 - 9} = ?$

14. An ice “cube” is melting at the rate of 3 cc (cubic centimeters) per minute. Find the rate at which an edge is decreasing when it is 10 cm long.
15. What is the slope of the line normal (the line that is perpendicular to the tangent) to the curve $y = x^2 + 2x$ at the point $(2,8)$?



Hand in your test booklet and all of your scrap paper.

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Day 2

Part 1 - Multiple Choice Questions

16. Evaluate $\int_1^4 \frac{1}{t} dt$
- (a) $\ln 3$
 - (b) *undefined*
 - (c) $\ln 4$
 - (d) $2 \ln 2$
 - (e) $3 \ln 2$
17. If $f(x) = x^2 + 4x + 2$ and $g(x) = 2x$, find $f(g(1))$.
- (a) 10
 - (b) 7
 - (c) 14
 - (d) 12
 - (e) 2
18. If a stone is dropped from a height of 100 feet, its height t seconds later will be h feet, where $h = 100 - 16t^2$. What is the velocity, in feet per second, of the stone when it hits the ground?
- (a) 6.25 ft/sec
 - (b) 16 ft/sec
 - (c) 32 ft/sec
 - (d) 80 ft/sec
 - (e) 100 ft/sec
19. If the maximum value of $f(x)$ is 2 and if $f'(x) = 2 - 2x$, then $f(x) = (?)$

(a) $-x^2 + 2x + 1$

(b) $-x^2 + 2x + 2$

(c) $-x^2 + 2x$

(d) $-x^2 + 2x - 1$

(e) $-x^2 + 2x - 2$

20. If $y = \sqrt{x^2 + x + 1}$, find $\frac{dy}{dx}$

(a) $(2x + 1)\sqrt{x^2 + x + 1}$

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

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

(d) $\frac{(2x + 1)}{(2\sqrt{x^2 + x + 1})}$

(e) $\frac{(2x + 1)}{\sqrt{x^2 + x + 1}}$

21.

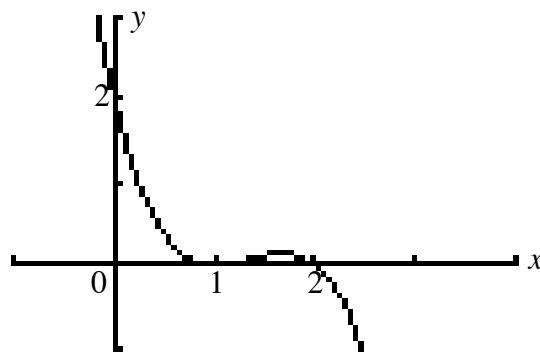


Figure 2

Which of the following can be the equation of the graph shown in Figure 2 above?

(a) $y = (1 - x)(x - 2)$

(b) $y = (1 - x)(2 - x)$

(c) $y = (1 - x)^2(2 - x)$

(d) $y = (1 - x)^2(x - 2)$

(e) $y = (1 - x)(2 - x)^2$

22. What is the slope of the graph of $y = \ln x$ at $x = 1$?

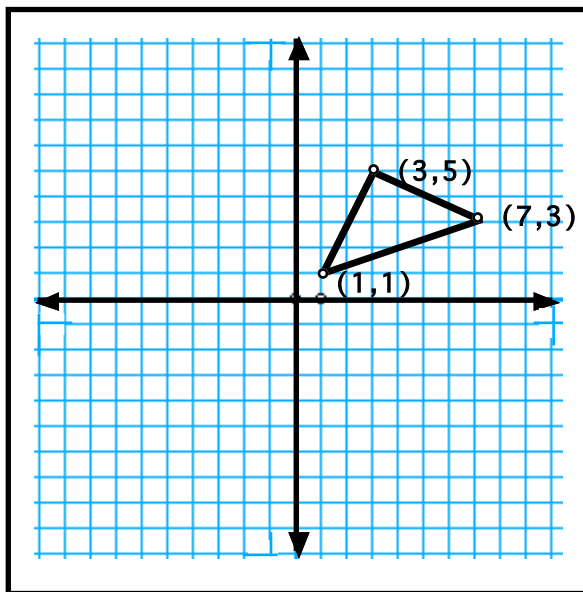
- (a) 0
- (b) $\frac{1}{e}$
- (c) 1
- (d) e
- (e) The slope is not defined at $x = 1$

23. If $f(x) = e^{3 \ln(x^2)}$, then $f'(2) = (?)$

- (a) 8
- (b) 64
- (c) 96
- (d) 192
- (e) 384

24. Find the area of the triangular region shown at the right.

- (a) 5
- (b) 10
- (c) 20
- (d) 15
- (e) 8.5



25. If $\sin(x) = e^y$, $0 < x < \pi$, then $\frac{dy}{dx} = (?)$ [hint: take the *natural log* of both sides first]

- (a) $-\tan(x)$
- (b) $-\cot(x)$
- (c) $\cot(x)$
- (d) $\tan(x)$
- (e) $\csc(x)$

26. If the line through $(0, 3)$ and $(3, 7)$ is parallel to the line through $(1, 5)$ and $(4, k)$, then $k = (?)$

27. What is the area of the region bounded by the line $y = \frac{x}{2}$ and the parabola $y^2 = x$?

28. If $3xy^3 = 8$, find $\frac{dy}{dx}$.

29. $\int x^2 \sqrt{x^3 + 3} dx = ?$

30.

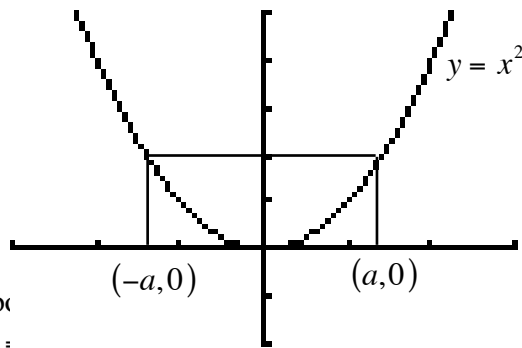


Figure 1 above shows a rectangle with vertices at $(-a, 0)$ and $(a, 0)$ and the other two on the parabola $y = x^2$.

Figure 1

ices at $(a, 0)$ and $(-a, 0)$ and the other two on the parabola. What is the area of the rectangle that lies below the parabola?

**Congratulations to the Class of 2003!!!
Best of luck in all of your future endeavors!!**

