ASSIGNMENT #1

1997 MULTIPLE CHOICE (selected problems)

Do not use a calculator on this portion.

1. $\int_1^2 (4x^3 - 6x)\,dx =$

(A) 2 (B) 4 (C) 6 (D) 36 (E) 42

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

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

(D) $\frac{-x+3}{\sqrt{2x-3}}$ (E) $\frac{5x-6}{\sqrt{2x-3}}$

3. The graph of $y = 3x^4 - 16x^3 + 24x^2 + 48$ is concave down for

(A) $x < 0$ (B) $x > 0$ (C) $x < -2 \quad or \quad x > -\frac{2}{3}$

(D) $x < \frac{2}{3} \quad or \quad x > 2$ (E) $\frac{2}{3} < x < 2$

4. $\frac{1}{2}\int e^{\frac{t}{2}}\,dt =$

(A) $e^{-t} + C$ (B) $e^{\frac{-t}{2}} + C$ (C) $e^{\frac{t}{2}} + C$

(D) $2e^{\frac{t}{2}} + C$ (E) $e^t + C$

5. $\frac{d}{dx}\cos^2\left(x^3\right) =$

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

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

6. An equation of the line tangent to the graph of $y = \cos(2x)$ at $x = \frac{\pi}{4}$ is

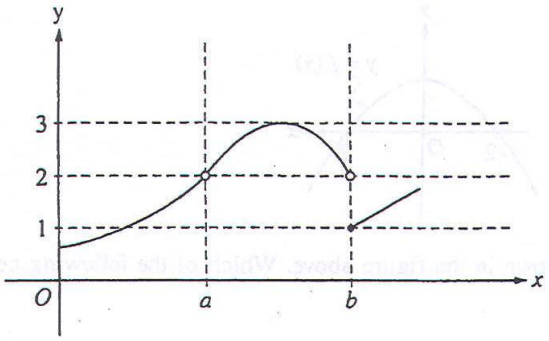
(A) $y - 1 = -\left(x - \frac{\pi}{4}\right)$ (B) $y - 1 = -2\left(x - \frac{\pi}{4}\right)$ (C) $y = 2\left(x - \frac{\pi}{4}\right)$

(D) $y = -\left(x - \frac{\pi}{4}\right)$ (E) $y = -2\left(x - \frac{\pi}{4}\right)$.

7. At what point on the graph of $y=\frac{1}{2}x^2$ is the tangent line parallel to the line $2x-4y=3$?

(A) $\left(\frac{1}{2},-\frac{1}{2}\right)$ (B) $\left(\frac{1}{2},\frac{1}{8}\right)$ (C) $\left(1,-\frac{1}{4}\right)$ (D) $\left(1,\frac{1}{2}\right)$ (E) $(2,2)$

8. The graph of the function *f* in shown in the figure. Which of the following statements about f is true?



(A) $\lim_{x\to a} f(x)=\lim_{x\to b} f(x)$

(B) $\lim_{x\to a} f(x)=2$

(C) $\lim_{x\to b} f(x)=2$

(D) $\lim_{x\to b} f(x)=1$

(E) $\lim_{x\to a} f(x)$ does not exist

9. If $x^2+y^2=25$, what is the value of $\frac{d^2y}{dx^2}$ at the point (4, 3)?

(A) $-\frac{25}{27}$ (B) $-\frac{7}{27}$ (C) $\frac{7}{27}$ (D) $\frac{3}{4}$ (E) $\frac{25}{27}$

10. If $f(x)=\ln\left|x^2-1\right|$, then $f'(x)$ =

(A) $\left|\frac{2x}{x^2-1}\right|$ (B) $\frac{2x}{\left|x^2-1\right|}$ (C) $\frac{2|x|}{x^2-1}$

(D) $\frac{2x}{x^2-1}$ (E) $\frac{1}{x^2-1}$

You may use a calculator on the remaining problems. It will not be needed on all problems.

11. If $f(x)=\frac{e^{2x}}{2x}$, then $f'(x)=$

(A) 1 (B) $\frac{e^{2x}(1-2x)}{2x^2}$ (C) e^{2x}

(D) $\frac{e^{2x}(2x+1)}{x^2}$ (E) $\frac{e^{2x}(2x-1)}{2x^2}$

12. Let f be a function such that $\lim_{h\to 0}\frac{f(2+h)-f(2)}{h}=5.$ Which of the following must be true?

I. f is continuous at x = 2.
II. f is differentiable at x = 2.

(A) I only (B) II only (C) I and II

13. Let *f* be the function given by $f(x)=2e^{4x^2}$. For what value of x is the slope of the line tangent to the graph of f at (*x, f(x)*) equal to 3?

(A) 0.168 (B) 0.276 (C) 0.318 (D) 0.342 (E) 0.551

14. If the derivative of *f* is given by $f'(x)=e^x-3x^2,$ at which of the following *x* does f have a relative maximum value?

(A) -0.46 (B) 0.20 (C) 0.91 (D) 0.95 (E) 3.73

15. If $y=2x-8,$ what is the minimum value of the product *xy* ?

(A) -16 (B) -8 (C) -4 (D) 0 (E) 2

16. What is the area of the region in the first quadrant enclosed by the graphs of $y=\cos x,\quad y=x,$ and the *y*-axis?

(A) 0.127 (B) 0.385 (C) 0.400 (D) 0.600 (E) 0.947

Do not use a calculator.

17. $\lim_{x\to 2}\frac{x-2}{x-2}$ 18. $\lim_{x\to 0}\frac{\sin x}{x}$ 19. $\lim_{x\to 5}2x^2-4x+7$

20. $\lim_{x\to\infty}\frac{x^2+4}{x-x^2}$ 21. $\lim_{x\to-\infty}\frac{2x+3}{1-x^2}$ 22. $\lim_{x\to-\infty}\frac{|8x+6|}{4x-2}$

1997 AB 1 Calculator Allowed

23. A particle moves along the *x*-axis so that its velocity at any time $t\geq 0$ is given by $v(t)=3t^2-2t-1.$ The position *x*(*t*) is 5 for *t* = 2.

(a) Write a polynomial expression for the position of the particle at any time $t\geq 0$.

(b) For what values of t, $0 \le t \le 3$, is the particle's instantaneous velocity the same as its average velocity on the closed interval [0, 3]?

(c) Find the total distance traveled by the particle from time $t = 0$ until time $t = 3$.

2002 AB 3 (Form B) Calculator Allowed

24. A particle moves along the x-axis so that its velocity v at any time t, for $0 \le t \le 16$, is given by $v(t) = e^{2\sin t} - 1$. At time $t = 0$, the particle is at the origin.

(a) Sketch the graph of v(t) for $0 \le t \le 16$.

(b) During what intervals of time is the particle moving to the left? Give a reason for your answer.

(c) Find the total distance traveled by the particle from $t = 0$ to $t = 4$.

(d) Is there any time t, $0 < t \le 16$, at which the particle returns to the origin? Justify your answer.

1983 AB 2 No Calculator

25. A particle moves along the x-axis so that at time t its position is given by $x(t) = t^3 - 6t^2 + 9t + 11$.

(a) What is the velocity of the particle at $t = 0$?

(b) During what time intervals is the particle moving to the left?

(c) What is the total distance traveled by the particle from $t = 0$ to $t = 2$?

26. The graph shown is the velocity function for a particle moving on a straight line.

(a) When is the particle at rest?

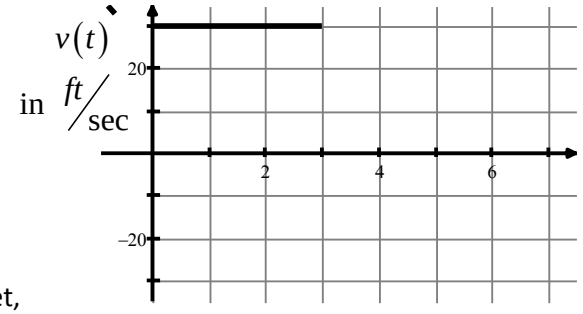
(b) Find $a(2)$, $a(3)$, and $a(5)$.

(c) Find the total distance traveled by the particle from $t = 0$ to $t = 7$ seconds.

(d) At what time is the velocity 10 ft/sec?

(e) Give a piecewise function for $v(t)$.

(f) If the position of the particle at time zero is 4 feet, find the position of the particle at time 7 seconds.



time in seconds

1982 AB 1 No Calculator

27. A particle moves along the x-axis in such a way that its acceleration at time t for $t > 0$ is given by $a(t) = \frac{3}{t^2}$.

When $t = 1$, the position of the particle is 6 and its velocity is 2.

(a) Write an equation for the velocity, $v(t)$, of the particle for all $t > 0$.

(b) Write an equation for the position, $x(t)$, of the particle for all $t > 0$.

(c) Find the position of the particle when $t = e$.