MATH 1309 SAMPLE PLACEMENT EXAMINATION

No calculators or textbooks allowed

1. $\int\left(x^4 - 2x^2\right)dx =$

   a) $4x^3 - 4x + C$ **b)** $\frac{1}{4}x^5 - x^3 + C$ **c)** $4x^3 - \frac{2}{3}x^3 + C$

   d) $\frac{1}{5}x^5 - \frac{2}{3}x^3 + C$ **e)** $\frac{1}{5}x^5 - \frac{1}{3}x^3 + C$

2. If $f(x) = x^2 + e^{4x}$, then $f'(x) =$

   a) $2x + 4e^{4x}$ **b)** $2x + \frac{1}{4}e^{4x}$ **c)** $2x + \ln(4x)$

   d) $\frac{1}{3}x^3 + 4e^{4x}$ **e)** $\frac{1}{3}x^3 + \frac{1}{4}e^{4x}$

3. If $f(x) = x^2 - x$, find the slope of the secant line connecting the points $(3, f(3))$ and $(3+h, f(3+h))$. A simplified answer is

   a) $7+h$ **b)** $5h+h^2$ **c)** $\frac{12+7h+h^2}{h}$ **d)** $5+h$ **e)** $\frac{12+5h+h^2}{h}$

4. A family paid \$80,000 cash for a house. Ten years later, they sold it for \$200,000. If interest is compounded continuously, $A = Pe^{rt}$, what annual rate *r* did the original \$80,000 earn?

   a) $\frac{1}{10}\ln\left(\frac{8}{20}\right)$ **b)** $\frac{20}{8}e^{10}$ **c)** $\frac{1}{10}\ln\left(\frac{20}{8}\right)$ **d)** $\frac{8}{20}e^{10}$ **e)** $10\ln\left(\frac{20}{8}\right)$

5. If $F'(x) = f(x)$ and $f(x)$ is continuous for all *x*, then $\int_a^b f(x)dx =$

   a) $F(a) - F(b)$ **b)** $F'(a) - F'(b)$ **c)** $f(b) - f(a)$
   d) $f'(b) - f'(a)$ **e)** $F(b) - F(a)$

6. $\lim_{x\to 3}\frac{x^2 - 2x - 3}{x^2 - 4x + 3} =$

a) 0 **b)** 2 **c)** 4 **d)** does not exist **e)** 1

7. The equation of the tangent line to the curve $y = \frac{1}{x}$ at $x = 2$ is

a) $y = -\frac{1}{2}x + \frac{3}{2}$ **b)** $y = -\frac{1}{4}x + \frac{1}{2}$ **c)** $y = (\ln 2)x - 2$

d) $y = \frac{1}{4}x$ **e)** $y = -\frac{1}{4}x + 1$

8. The total cost in dollars of producing x electric guitars is $C(x) = 1000 + 100x - \frac{x^2}{4}$. The marginal cost at a production level of 40 guitars is

a) \$80 **b)** \$4,600 **c)** \$100 **d)** \$20 **e)** \$90

9. $\int_0^{\ln 2} e^{2x}\,dx =$

a) e^2 **b)** 3 **c)** $\frac{3}{2}$ **d)** $\frac{1}{2}\left(e^2 - 1\right)$ **e)** $e^{2\ln 2}$

10. The integral that represents the area bounded by $y = -2x + 10$ and $y = -x^2 + 4x + 5$ is

a) $\int_5^{10} \left(x^2 - 2x - 15\right) dx$ **b)** $\int_1^5 \left(-x^2 + 2x + 15\right) dx$ **c)** $\int_1^5 \left(-x^2 + 6x - 5\right) dx$

d) $\int_1^5 \left(x^2 - 6x + 5\right) dx$ **e)** $\int_5^{10} \left(-x^2 + 6x - 5\right) dx$

11. $\int_1^4 \left[\frac{4}{x^2} + \frac{1}{x}\right] dx =$

a) $\frac{3}{2} + \ln 4$ **b)** $3 + 2\ln 2$ **c)** $8\frac{13}{16}$ **d)** $-3 + \ln 4$ **e)** $-\frac{3}{2} + \ln 2$

12. Substituting $u = x^2 - 6x$ into the definite integral $\int_1^2 (x^2 - 6x)(x-3)\,\mathrm{dx}$ gives the following equivalent integral:

a) $\frac{1}{2}\int_1^2 udu$ **b)** $-2\int_{-8}^{-5} udu$ **c)** $\int_{-5}^{-8} udu$ **d)** $\frac{1}{2}\int_{-5}^{-8} udu$ **e)** $2\int_1^2 udu$

13. $\int \frac{3x}{1+x^2}\,dx =$

a) $3\ln(1+x^2)+C$ **b)** $\frac{3x}{(1+x^2)^2}+C$ **c)** $\frac{3x^2}{(1+x^2)^2}+C$

d) $\frac{3}{2}x\ln(1+x^2)+C$ **e)** $\frac{3}{2}\ln(1+x^2)+C$

14. If $f(x) = \left[5+e^{x^2}\right]^6$, $f'(x) =$

a) $6\left[5+\mathrm{e}^{x^2}\right]^5\left[2x\mathrm{e}^{x^2}\right]$ **b)** $6\left[5+e^{x^2}\right]^5$ **c)** $6\left[5+e^{x^2}\right]^5\left[e^{x^2}\right]$

d) $6\left[5+e^{x^2}\right]^5\left[5+2xe^{x^2}\right]$ **e)** $6\left[5+e^{x^2}\right]^5\left[5x+e^{x^2}\right]$

15. The function $f(x) = 3x^5 - 10x^3$; all values of x for which the graph of f is concave up are

a) $-1 < x < 0$ or $x > 1$ **b)** $x > 0$ **c)** $-1 < x < 1$ **d)** $x < 0$ **e)** $x < -1$ or $0 < x < 1$

16. $\int_{-1}^{2} (x+2)^{1/2}\,dx =$

a) $\frac{16}{3}$ **b)** 1 **c)** $\frac{21}{2}$ **d)** $-\frac{1}{4}$ **e)** $\frac{14}{3}$

17. If $f(x) = x^2 \ln x$, $f'(x) =$

a) $2x\ln x$ **b)** 2 **c)** $2x\ln x + x^2$ **d)** $2x\ln x + x$ **e)** $x\ln(2x)$

18. $f(x) = 2x^3 - 3x^2 - 12x$ attains a maximum at $x =$

a) 2 **b)** -1 **c)** 0 **d)** -2 **e)** 1

19. A 200 room motel is filled to capacity every night at \$40 per room. For each \$1 increase in cost per room, 4 fewer rooms are filled. If p is the price of a room, find the income equation that should be used to maximize income.

a) $p(40+4p)$ **b)** $p(200-4p)$ **c)** $(p+1)(200-4p)$

d) $p(360-4p)$ **e)** $40(360-4p)$

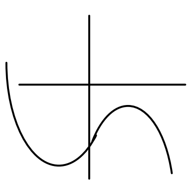
20. If $f(x) = \dfrac{x^2+5}{3x-1}$, $f'(x) =$

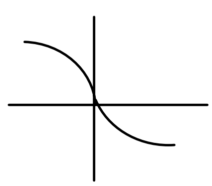
a) $\dfrac{9x^2-2x+15}{(3x-1)^2}$ **b)** $\dfrac{2x}{3}$ **c)** $\dfrac{3x^2-2x-15}{(3x-1)^2}$ **d)** $\dfrac{2x}{(3x-1)^2}$ **e)** $\dfrac{2x}{3x-1}$

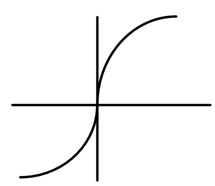
21. If $f(x) = x^2 - \dfrac{1}{3}x^3$ and its domain is the set of all x such that $-3 \le x \le 3$, the maximum value of $f(x)$ is

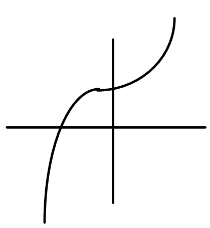
a) 0 **b)** 18 **c)** 3 **d)** $\dfrac{8}{3}$ **e)** -3

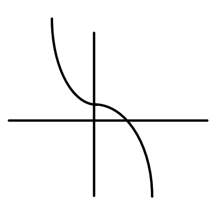
22. If y is a function of x such that $y' < 0$ for all x, and $y'' > 0$ for all $x < 0$ and $y'' < 0$ for all $x > 0$, which of the following could be part of the graph of $y = f(x)$?

a) 

b) 

c) 

d) 

e) 

23. If $f(x) = (x^2 + 5)(2x^3 - x^2)$, $f'(1)$ =

a) 26 **b)** 8 **c)** 28 **d)** 6 **e)** 16

24. If $f(x) = x + \frac{4}{x}$, the values of x for which f decreases are

a) $(-2,0) \cup (0,2)$ **b)** all $x \neq 0$ **c)** $x > 0$ **d)** $(-\infty, -2) \cup (2, \infty)$ **e)** $x < 2$

25. A fence is to be built to enclose a rectangular area of 800 sq. ft. The fence along three sides costs $2.00 per foot and the fence along the fourth side costs $6.00 per foot. The equations below are for area and cost:

$$xy = 800, \qquad C = 2(2x + y) + 6y.$$

The dimensions of the rectangle that will allow the most economical fence to be built are

a) 50×16 **b)** 40×20 **c)** 32×25 **d)** $20\sqrt{2} \times 20\sqrt{2}$ **e)** none of a) - d)

26. The vertical and horizontal asymptotes of $y = \frac{x^2 - 4}{4x^2 - 1}$ are

a) $\text{x} = \pm\frac{1}{2}$ and $\text{y} = \pm 2$ **b)** $x = \pm\frac{1}{2}$ and $y = 4$ **c)** $\text{x} = \pm 2$ and $\text{y} = \pm\frac{1}{2}$

d) $x = \pm 2$ and $y = \frac{1}{4}$ **e)** $x = \pm\frac{1}{2}$ and $\text{y} = \frac{1}{4}$

27. The graph of $y = x^4 - 2x^3 - 12x^2$ has an inflection point at $x =$

a) 0 **b)** -1 **c)** 2 **d)** -1 and 2 **e)** 0 and 2

28. $\int (\text{x}^2 + 4)^{10}\, \text{xdx} =$

a) $\frac{1}{22}(x^2 + 4)^{11} x^2 + C$ **b)** $\frac{1}{22}(x^2 + 4)^{11} + C$ **c)** $10(x^2 + 4)^9 + C$

d) $20x(x^2+4)^9+C$ **e)** $\frac{1}{11}(x^2+4)^{11}+C$

Answer Key:

1. d 2. a 3. d 4. c 5. e 6. b 7. e 8. a 9. c 10. c 11. b
12. d 13. e 14. a 15. a 16. e 17. d 18. b 19. d 20. c 21. b 22. e
23. a 24. d 25. b 26. e 27. d 28. b

A passing score would be 22, or more, correct answers.