

INSTRUCTOR _____ NAME _____

MATH 121 – FINAL EXAMINATION

Friday, May 5, 2006, 3 P.M.–6 P.M.

(1). The function $f(x) = \frac{e^{ax}}{1 + e^x}$ is even when $a =$:

- (a) 0 (b) $\frac{1}{2}$ (c) 1 (d) -1 (e) none of these.

(2). The derivative of $\cos\left(e^x + \frac{1}{\sqrt{x}}\right)$ is:

- (a) $\left(e^x + \frac{1}{2\sqrt{x}}\right) \sin\left(e^x + \frac{1}{\sqrt{x}}\right)$; (b) $-\left(e^x - \frac{1}{2\sqrt{x}}\right) \sin\left(e^x + \frac{1}{\sqrt{x}}\right)$;
(c) $\sin\left(e^x + \frac{1}{\sqrt{x}}\right)$; (d) $-\sin\left(e^x + \frac{1}{\sqrt{x}}\right)$; (e) none of these.

(3). When $a > 0$, the absolute minimum of $f(x) = x^2 + \frac{a}{x}$ on the interval $(0, \infty)$ is

- (a) $\sqrt[3]{a}$ (b) \sqrt{a} (c) $\sqrt[3]{a/2}$ (d) some other number
(e) there is no absolute minimum on that interval.

(4). At the point $(1, 1)$ the curve $y^3 + 2x^2y - 3x^2 = 0$ has slope

- (a) $\frac{2}{5}$ (b) $\frac{6}{5}$ (c) $\frac{6}{7}$ (d) some other number (e) does not exist.

(5). The average value of $f(x) = x^2$ on the interval $[0, 2]$ is

- (a) 1 (b) $\frac{4}{3}$ (c) 2 (d) $\frac{8}{3}$ (e) none of these.

(6). You have 120 feet of fencing and want to enclose a rectangular area with one side on a long straight wall and fencing on the other three sides. The largest area you can enclose is:

- (a) 800 sq.ft. (b) 1350 sq.ft. (c) 1600 sq.ft. (d) 2100 sq.ft. (e) none of these.

(7). The tangent line to the graph of $f(x) = (x + 2)e^{-x}$ at the point $x = 0$ is:

- (a) $y = 3x + 2$ (b) $y = 3x$ (c) $y = -x$
(d) $y = -x + 2$ (e) none of these.

(8). The horizontal asymptote of the graph of $f(x) = \frac{\sqrt{4x^2 + 1}}{2x - 1}$ when $x \rightarrow \infty$ is

- (a) $y = -1$ (b) $y = 1$ (c) $y = 2$ (d) $y =$ some other number
(e) this graph does not have a horizontal asymptote.

(9). The graph of $f(x) = \frac{(x^2 - 1)(x^2 - 4)}{(x - 1)^2(x - 2)(x - 3)}$ has how many vertical asymptotes

- (a) 0 (b) 1 (c) 2 (d) 3 (e) some other number

(10). The position of a particle at time t is given by $s(t) = (t - 1)(t - 2)$. The particle is at rest when

- (a) $t = 1$ only (b) $t = 2$ only (c) $t = 1$ and $t = 2$
(d) $t = \frac{3}{2}$; (e) none of these.

(11). $\lim_{x \rightarrow 1^+} \frac{x^2 - 3x + 2}{x^2 - 4x + 3}$ equals

- (a) 0 (b) $\frac{1}{2}$ (c) ∞ (d) $-\infty$ (e) none of these.

(12). $\lim_{n \rightarrow \infty} \frac{\pi}{2n} \sum_{i=1}^{i=n} \cos\left(\frac{i\pi}{2n}\right)$ equals

- (a) 0 (b) 1 (c) ∞ (d) $-\infty$ (e) none of these.

(13). The absolute maximum of $f(x) = \frac{\ln(x)}{\sqrt{x}}$ occurs at

- (a) $x = e$ (b) $x = 2e$ (c) $x = e^2$ (d) some other number
(e) this function does not have an absolute maximum.

(14). A solid of revolution is generated by revolving about the y -axis the first quadrant region below the curve $y = x\sqrt{1-x^3}$. Its volume is:

- (a) $\frac{\pi}{6}$ (b) $\frac{2\pi}{3}$ (c) $\frac{4\pi}{9}$ (d) 0 (e) some other number.

(15). A solid of revolution is generated by revolving about the x -axis the first quadrant region below the curve $y = \sqrt{1-x^3}$. Its volume is:

- (a) $\frac{\pi}{6}$ (b) $\frac{2\pi}{3}$ (c) $\frac{4\pi}{9}$ (d) $\frac{3\pi}{4}$ (e) some other number.

- (16). The area of the bounded region between the curves $y = x$ and $y = x^2 - x$ equals
(a) $\frac{2}{3}$ (b) $\frac{4}{3}$ (c) $\frac{8}{3}$ (d) 1 (e) some other number.

(17). $\int \frac{x^3 dx}{1+x^4}$ equals:

- (a) $\frac{x^4}{4} \tan^{-1}(x^2) + C$ (b) $\frac{1}{3} x^3 \tan^{-1}(x^2) + C$ (c) $\frac{1}{4} \ln |1+x^4| + C$
(d) $\frac{x^4}{1+\frac{x^5}{5}} + C$; (e) none of these.

(18). $\int e^{3x} dx$ equals

- (a) $e^{3x} + C$ (b) $3e^{3x} + C$ (c) $\frac{1}{3}e^{3x} + C$ (d) $\frac{\sqrt{\pi}}{17} e^{3x} + C$ (e) none of these.

(19). $\int \tan x \ln(\cos x) dx$ equals

- (a) $-\frac{1}{2} (\ln(\cos x)^2) + C$; (b) $\ln(\cos x) + x \ln(\cos x)$ (c) $\sec^2 x \tan x + C$
(d) $-\ln(\cos x) + x \ln(\cos x)$ (e) none of these.

(20). A person 6 ft. tall is running away from a street light 30 ft high at the rate of 12 ft/sec. The length of the person's shadow is increasing at the rate of

- (a) 2.4 ft/sec (b) 3 ft/sec (b) 14.4 ft/sec (b) 15 ft/sec (e) none of these.
(f) depends on the person's position.