Review the Prerequisites for Calculus II

Name: **Panther ID:**

(1) When evaluating limits, what are indeterminate forms?

(2) State the squeezing Theorem

(3) State the Mean-Value Theorem

(4) Find the derivative of

$$f(x) = 3x^5 + 3\cos^4(x) - \ln(x^2+1) - 4\tan(2x) + \sec(\sqrt{x}) + x\arctan(x^2) - e^{3x} + x^{\sqrt{2}} + x\arcsin(2x)$$

(5) Evaluate the limits (a) $\lim_{x\to\infty} \frac{4x^4 - 3x^2 + 5x + 9}{7x^4 + x^3 - 2x^2 + 6x + 8}$ (b) $\lim_{x\to 0} \frac{\sin^2(3x)}{x^2}$ (c) $\lim_{x\to\infty} \frac{x}{e^x}$

(d) $\lim_{x\to\infty} \left(\frac{x+2}{x}\right)^x$ (e) $\lim_{x\to\infty} \frac{x}{\ln x}$ (f) $\lim_{x\to 1} \frac{x^{2015} - 1}{\sqrt{2x+7} - 3}$

(6) If $\cos\theta = 0.3$ find $\cos(2\theta)$, and $\sin(2\theta)$

(7) State the exact values of all 6 trig. $\cos\theta, \sin\theta, \tan\theta, sec\theta, csc\theta, cot\theta$ functions when

$\theta = 0; \pi/6, \pi/4, \pi/3, \pi/2, 2\pi/3, 3\pi/4, 5\pi/6, 7\pi/6, 5\pi/4, 4\pi/3, 3\pi/2, 11\pi/6$

(8) State 10 trigonometric identities
(9) Find the indicated integral

a) $\int (3x^2 - x + 1)\, dx$ b) $\int \frac{y^2+1}{y}\, dy$ c) $\int \frac{-4}{x\sqrt{1-x^2}}\, dx$ d) $\int (\csc^2 t - \sec t \tan t)\, dt$

e) $\int (\frac{\sec\theta}{\cos\theta})\, d\theta$ f) $\int \frac{5 - 2x + x^2 + x^4}{1+x^2}\, dx$ g) $\int \cot^2 x\, dx$ h) $\int \sin^3 x\, dx$ i) $\int y\sqrt{4-y}\, dy$

j) $\int \frac{x}{\sqrt{x^2-1}}\, dx$ k) $\int \csc^4 x\, dx$ l) $\int \sin^4 2x \cos^3 2x\, dx$ m) $\int \frac{e^x}{1+e^{2x}}\, dx$ n) $\int \frac{x^2}{x^2+1}\, dx$

(10) Write down the nth term of the sequence suggested by the pattern

a) $1, -2, 3, -4, 5, -6, ...$ b) $2, -2, 2, -2, ...$ c) $7, 1, -5, -11, ...$ d) $-2, 4, -6, 8, ...$

e) $\frac{2}{3}, \frac{4}{9}, \frac{8}{27}, \frac{16}{81} ...$ f) $1, 3, 5, 7, 9, ...$ g) $0.4, 0.04, 0.004, ...$ h) $0.2, -0.02, 0.002, -0.0002, ...$

(11) Express the sum using summation notation a) $5 + 7 + 9 + ... + 205$, b) $4 + 8 + 16 + ... + 2^{100}$

(12) **Plot** in polar coordinates the point $(3, -2\pi/3)$. Find other polar coordinates (r, θ) for which

(a) $r > 0,\ 0 < \theta < 2\pi$ (b) $r < 0,\ 2\pi < \theta < 4\pi$

(13) Identify and make of rough sketch of each polar equation

a) $r = 2 + 2\sin(\theta)$ b) $r = 5\sin(4\theta)$

(14) Find the sum a) $\sum_{k=5}^{40} 6$ b) $\sum_{k=1}^{60} k^2$ c) $\sum_{k=1}^{20} (k^3 - 2k^2 + 4k - 3)$ e) $\sum_{k=1}^{60} 4(\frac{3}{2})^{k-1}$

(15) Determine whether the geometric series converges or diverges. If it converges, find its sum.

a) $\sum_{k=1}^{\infty} \frac{9}{10^k}$ b) $\sum_{k=1}^{\infty} \frac{(3)^{k-1}}{4}$ c) $\sum_{k=1}^{\infty} 4(\frac{3}{2})^{k-1}$

(16) Use the principle of mathematical induction to show that

a) $1 \times 2 + 2 \times 3 + 3 \times 4 + ... + n(n+1) = \frac{n(n+1)(n+2)}{3}$

b) $1^2 + 2^2 + 3^2 + ... + (n+2)^2 = \frac{(n+2)(n+3)(2n+5)}{6}$

(17) a) Find the length of the arc of a circle of radius $r = 5$ feet subtended by a central angle of $\theta = 48^o$

b) Find the area of the sector of a circle

(18) Find the surface area of a cylinder with height 5cm and radius 6cm