Calculus Name_____

Some Review Problems for test Trig/Inverse Trig

Differentiate each function with respect to *x*.

1) $y = \sin 2x^5$

2) $y = \cos 4x^2$

3) $y = \tan 4x^4$

4) $y = \csc 4x^5$

5) $y = \sec 5x^4$

6) $y = \cot 3x^4$

7) $y = \cot 2x^4 \cdot (-5x^2 + 2)$

8) $y = \tan^{-1} -x^2$

9) $y = \cos^{-1} x^3$

10) $y = \cot^{-1} 4x^2$

11) $y = \csc^{-1} 2x^3$

12) $y = \sin^{-1} -x^4$

13) $y = \sec^{-1} -5x^2$

For each problem, find all points of absolute minima and maxima on the given interval.

14) $y = 2\cot(x)$; $[-\frac{\pi}{3}, -\frac{\pi}{4}]$

15) $y = -\csc(x)$; $[-\frac{\pi}{4}, \frac{\pi}{6}]$

16) $y = -2\sin(x)$; $[\frac{\pi}{4}, \frac{\pi}{3}]$

17) $y = -\cos(x)$; $[\frac{\pi}{6}, \frac{\pi}{4}]$

For each problem, find the open intervals where the function is concave up and concave down.

18) $y = 2\cot(x)$; $[-\pi, \pi]$

19) $y = -2\sin(x)$; $[-\pi, \pi]$

For each problem, find the open intervals where the function is increasing and decreasing.

20) $y = -2\sin(2x)$; $[-\pi, \pi]$

21) $y = -\tan(2x)$; $[-\pi, \pi]$

For each problem, find the values of *c* that satisfy Rolle's Theorem.

22) $y = \cos(2x)$; $[-\pi, \pi]$

23) $y = 2\sin(x)$; $[-\pi, \pi]$

For each problem, find the equation of the line tangent to the function at the given point. Your answer should be in slope-intercept form.

24) $y = 2\cot(x)$ at $\left(\frac{3\pi}{4}, -2\right)$

25) $y = 2\sin(2x)$ at $\left(\frac{\pi}{2}, 0\right)$

For each problem, find the equation of the line normal to the function at the given point. If the normal line is a vertical line, indicate so. Otherwise, your answer should be in slope-intecept form.

26) $y = \cos(x)$ at $\left(-\frac{\pi}{2}, 0\right)$

27) $y = 2\cot(x)$ at $\left(\frac{\pi}{4}, 2\right)$

For each problem, find the points where the tangent line to the function is horizontal. Indicate if no horizontal tangent line exists.

28) $y = -2\sin(x)$; $[-\pi, \pi]$

29) $y = -2\cos(2x)$; $[-\pi, \pi]$

30) $y = -\cot(2x)$; $[-\pi, \pi]$

31) $y = -\csc(x)$; $[-\pi, \pi]$

Answers to Some Review Problems for test Trig/Inverse Trig

1) $\frac{dy}{dx} = \cos 2x^5 \cdot 10x^4$
$= 10x^4 \cos 2x^5$

2) $\frac{dy}{dx} = -\sin 4x^2 \cdot 8x$
$= -8x \sin 4x^2$

3) $\frac{dy}{dx} = \sec^2 4x^4 \cdot 16x^3$
$= 16x^3 \sec^2 4x^4$

4) $\frac{dy}{dx} = -\csc 4x^5 \cot 4x^5 \cdot 20x^4$
$= -20x^4 \csc 4x^5 \cot 4x^5$

5) $\frac{dy}{dx} = \sec 5x^4 \tan 5x^4 \cdot 20x^3$
$= 20x^3 \sec 5x^4 \tan 5x^4$

6) $\frac{dy}{dx} = -\csc^2 3x^4 \cdot 12x^3$
$= -12x^3 \csc^2 3x^4$

7) $\frac{dy}{dx} = \cot 2x^4 \cdot -10x + \left(-5x^2 + 2\right) \cdot -\csc^2 2x^4 \cdot 8x^3$
$= 2x\left(-5\cot 2x^4 + 20x^4 \csc^2 2x^4 - 8x^2 \csc^2 2x^4\right)$

8) $\frac{dy}{dx} = \frac{1}{\left(-x^2\right)^2 + 1} \cdot -2x$
$= -\frac{2x}{x^4 + 1}$

9) $\frac{dy}{dx} = -\frac{1}{\sqrt{1 - \left(x^3\right)^2}} \cdot 3x^2$
$= -\frac{3x^2}{\sqrt{1 - x^6}}$

10) $\frac{dy}{dx} = -\frac{1}{\left(4x^2\right)^2 + 1} \cdot 8x$
$= -\frac{8x}{16x^4 + 1}$

11) $\frac{dy}{dx} = -\frac{1}{\left|2x^3\right| \sqrt{\left(2x^3\right)^2 - 1}} \cdot 6x^2$
$= -\frac{6x^2}{\left|2x^3\right| \sqrt{4x^6 - 1}}$

12) $\frac{dy}{dx} = \frac{1}{\sqrt{1 - \left(-x^4\right)^2}} \cdot -4x^3$
$= -\frac{4x^3}{\sqrt{1 - x^8}}$

13) $\frac{dy}{dx} = \frac{1}{\left|-5x^2\right| \sqrt{\left(-5x^2\right)^2 - 1}} \cdot -10x$
$= -\frac{10x}{\left|-5x^2\right| \sqrt{25x^4 - 1}}$

14) Absolute minimum: $\left(-\frac{\pi}{4}, -2\right)$
Absolute maximum: $\left(-\frac{\pi}{3}, -\frac{2\sqrt{3}}{3}\right)$

15) No absolute minima.
No absolute maxima.

16) Absolute minimum: $\left(\frac{\pi}{3}, -\sqrt{3}\right)$
Absolute maximum: $\left(\frac{\pi}{4}, -\sqrt{2}\right)$

17) Absolute minimum: $\left(\frac{\pi}{6}, -\frac{\sqrt{3}}{2}\right)$
Absolute maximum: $\left(\frac{\pi}{4}, -\frac{\sqrt{2}}{2}\right)$

18) Concave up: $\left(-\pi, -\frac{\pi}{2}\right), \left(0, \frac{\pi}{2}\right)$ Concave down: $\left(-\frac{\pi}{2}, 0\right), \left(\frac{\pi}{2}, \pi\right)$

19) Concave up: $(0, \pi)$ Concave down: $(-\pi, 0)$

20) Increasing: $\left(-\frac{3\pi}{4}, -\frac{\pi}{4}\right), \left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$ Decreasing: $\left(-\pi, -\frac{3\pi}{4}\right), \left(-\frac{\pi}{4}, \frac{\pi}{4}\right), \left(\frac{3\pi}{4}, \pi\right)$

21) Increasing: No intervals exist. Decreasing: $\left(-\pi, -\frac{3\pi}{4}\right), \left(-\frac{3\pi}{4}, -\frac{\pi}{4}\right), \left(-\frac{\pi}{4}, \frac{\pi}{4}\right), \left(\frac{\pi}{4}, \frac{3\pi}{4}\right), \left(\frac{3\pi}{4}, \pi\right)$

22) $\left\{-\frac{\pi}{2}, 0, \frac{\pi}{2}\right\}$

23) $\left\{-\frac{\pi}{2}, \frac{\pi}{2}\right\}$

24) $y = -4x + -2 + 3\pi$

25) $y = -4x + 2\pi$

26) $y = -x - \frac{\pi}{2}$

27) $y = \frac{1}{4}x + \frac{32 - \pi}{16}$

28) $\left(-\frac{\pi}{2}, 2\right), \left(\frac{\pi}{2}, -2\right)$

29) $(-\pi, -2), \left(-\frac{\pi}{2}, 2\right), (0, -2), \left(\frac{\pi}{2}, 2\right), (\pi, -2)$

30) No horizontal tangent line exits.

31) $\left(-\frac{\pi}{2}, 1\right), \left(\frac{\pi}{2}, -1\right)$