_____ / 22 total points

Test #2

Name: _____

Math 18, Prof. Beydler

Monday, October 15, 2018

Directions: Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, no smart watches, etc.). If you have a phone in your lap or on your chair, it is considered cheating, and you will receive a zero on this test. Write your answers in the indicated places, or box your answers. Good luck!

1. (2 points) Factor the following.

$8(2x+3)^4(x-2)+32(2x+3)^3(x-2)^2$

Answer: $8(2x+3)^3(x-2)(6x-5)$

$8(2x+3)^3(x-2)\left[(2x+3)+4(x-2)\right]$

2. Given $f(x)=\sin x$, $g(x)=x^2-3$, and $h(x)=\sqrt{1+2x}$, evaluate

a) (2 points) $(h\circ f)(\pi)$

$h(f(\pi))=h(\sin\pi)$

$=h(0)$

$=\sqrt{1+2(0)}$

Answer: 1

b) (2 points) $h\big(f(g(x))\big)$

$=h(f(x^2-3))$

$=h(\sin(x^2-3))$

Answer: $\sqrt{1+2\sin(x^2-3)}$

3. (2 points) Find $g\circ f$ for the following function. Find the domain for the composition.

$f(x)=x^2-4$, $g(x)=\frac{1}{x}$

$g\circ f=\frac{1}{x^2-4}$

Domain of $g\circ f$: $\{x\mid x\neq 2,-2\}$

(OR $(-\infty,-2)\cup(-2,2)\cup(2,\infty)$)

Need: $x^2-4\neq 0$

$(x-2)(x+2)\neq 0$

$x\neq 2$ $\quad x\neq -2$

4. (2 points) Decompose the following functions. Make sure none of your functions are just x.

a) $f(g(x)) = e^{\sqrt{x}}$

$f(x) =$ e^x

$g(x) =$ $\sqrt{x}$

b) $f\left(g(h(x))\right) = \sin\frac{1}{(\ln x)^2}$

$f(x) =$ $\sin x$

$g(x) =$ $\frac{1}{x^2}$

$h(x) =$ $\ln x$

5. (2 points) Each of the following functions is a combination of two or more functions of the variable x. They are either a sum, difference, product, quotient, composition or combination of these. Describe each in words. Don't just write "product" but follow the example shown and specify the functions.

Example: $x^2\cos(2x+1)$ is a product of x^2 and $\cos(2x+1)$ and a composition of $2x+1$ inside $\cos x$

$\frac{x^2}{\sqrt{\cos x}}$

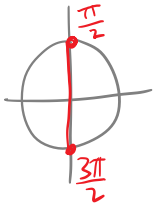
$\frac{x^2}{\sqrt{\cos x}}$ is a quotient of x^2 and $\sqrt{\cos x}$ and a composition of $\cos x$ inside $\sqrt{x}$

6. (3 points) Solve the following equations.

$\cos^2 x - \sin x \cos x = 0$

$\cos x(\cos x - \sin x) = 0$

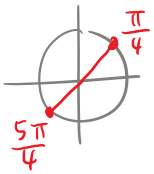
$\cos x = 0$



$\cos x - \sin x = 0$

$\cos x = \sin x$

$1 = \tan x$



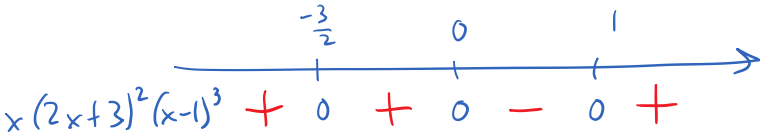
Answer: $\frac{\pi}{4} + \pi k$, $\frac{\pi}{2} + \pi k$

7. (3 points) Solve the following inequality.

$$x(2x+3)^2(x-1)^3 < 0$$

0, $-\frac{3}{2}$, 1

Answer: $[0, 1]$



8. (3 points) Expand the following expression using the properties of logarithms.

$$\log \sqrt{\frac{10\sin^3 x}{3x^2-x-2}}$$

Answer: $\frac{1}{2}\left[1 + 3\log(\sin x) - \log(3x+2) - \log(x-1)\right]$

$$= \frac{1}{2}\log\frac{10(\sin x)^3}{(3x+2)(x-1)}$$

$$= \frac{1}{2}\left[\underbrace{\log 10}_{1} + \underbrace{\log(\sin x)^3}_{3\log(\sin x)} - \log(3x+2) - \log(x-1)\right]$$

9. (1 point) Determine whether the following statement is true or false.

$$\ln\sqrt[4]{x+y} = \frac{1}{4}\ln x + \frac{1}{4}\ln y$$

True (False) (circle one)

$\left(\ln\sqrt[4]{x+y} = \frac{1}{4}\ln(x+y)\right)$