Name Answer Key   Date

Calc I H – Final Exam Review 3   Per

14.) Find $\frac{dy}{dx}$, given $y=-x^3\cos 2x-\csc(3x+1)$.

$$\frac{dy}{dx}=-3x^2\cos 2x-x^3(-2\sin 2x)-(-3\csc(3x+1)\cot(3x+1))$$

$$=\boxed{-3x^2\cos(2x)+2x^3\sin(2x)+3\csc(3x+1)\cot(3x+1)}$$

15.) Find y', given $y=x^2\sin(4x-2)+\tan(2x-1)$.

$$y'=\boxed{2x\sin(4x-2)+4x^2\cos(4x-2)+2\sec^2(2x-1)}$$

16.) Find an equation of the tangent line to the curve at the given *x*-value:

$y=-2x^3+x^2+11$ at $x=1$.

$y(1)=-2+1+11=10$

$y'=-6x^2+2x$

$y'(1)=-6+2=-4=m$

$(1,10)$ $m=-4$

$$\boxed{y-10=-4(x-1)}$$

17.) Evaluate the following integrals:

a) $\int x^3(x^4+10)^{10}\,dx$

$u=x^4+10$

$\frac{du}{dx}=4x^3\Rightarrow dx=\frac{du}{4x^3}$

$$\int \cancel{x^3}\,u^{10}\cdot\frac{du}{4\cancel{x^3}}=\frac{1}{4}\int u^{10}du$$

$$=\frac{1}{4}\cdot\frac{u^{11}}{11}+C=\boxed{\frac{(x^4+10)^{11}}{44}+C}$$

b) $\int xe^{x^2}dx$

$u=x^2$

$\frac{du}{dx}=2x\Rightarrow dx=\frac{du}{2x}$

$$\int \cancel{x}e^u\cdot\frac{du}{2\cancel{x}}=\frac{1}{2}\int e^u du$$

$$=\frac{1}{2}e^u+C=\boxed{\frac{1}{2}e^{x^2}+C}$$

18.) Differentiate $y=\frac{4x+1}{x^2-1}$ $y'=\frac{4(x^2-1)-2x(4x+1)}{(x^2-1)^2}$ $y'=\frac{4x^2-4-8x^2-2x}{(x^2-1)^2}=\boxed{\frac{-4x^2-2x-4}{(x^2-1)^2}}$	19.) Evaluate: $\int 5\csc 4x\cot 4x dx$ $u=4x$ $\frac{du}{dx}=4 \Rightarrow dx=\frac{du}{4}$ $5\int \csc u \cot u \cdot \frac{du}{4}$ $=-\frac{5}{4}\csc u + C = \boxed{-\frac{5}{4}\csc(4x)+C}$

20.) Given the function $f(x)=x^3-12x$, use calculus to analyze and graph of the function.

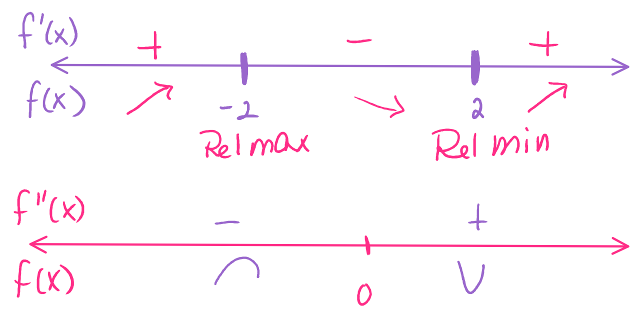
$f'(x)=3x^2-12=0$
$x^2-4=0$
$(x+2)(x-2)=0$
$x=\pm 2$

$f''(x)=6x=0$
$x=0$

$f(-2)=-8+24=16$
$f(2)=8-24=-16$

$f(x)=0=x^3-12x$
$0=x(x^2-12)$
$x=0, \pm\sqrt{12}$
$=0, \pm 2\sqrt{3}$

Domain: $(-\infty, \infty)$



x-intercept(s): $(0,0)$, $(-2\sqrt{3},0)$, $(2\sqrt{3},0)$

y-intercept: $(0,0)$

Vertical asymptote(s): none

Horizontal asymptote(s): none

Slant asymptote(s): none

Incr: $(-\infty,-2)\cup(2,\infty)$ $f'(x)>0$

Decr: $(-2,2)$ $f'(x)<0$

Extrema: $(-2,16)$ max $f'>0 \to f'<0$

$(2,-16)$ min $f'<0 \to f'>0$

Conc Up: $(0,\infty)$ $f''>0$

Conc Down: $(-\infty,0)$ $f''<0$

POI: $(0,0)$