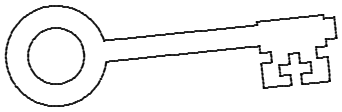


Calculus I

MATH 2200—Fall 2003

Sample #1—Gateway Exam

Name (Print) .....

Instructor/Section ..... **Date** .....

Instructions: Find each of the following. No aids are allowed.

1. $\dfrac{d}{dx}\left(3x^4 - 6x^{3/4} - \dfrac{\pi}{2}\right)$

2. $\dfrac{d}{dt}\sqrt[3]{8-4t^2}$

3. $\dfrac{d}{dx}\, x^3 \sin 5x$

4. $\dfrac{d}{dt}\, e^{t^2-3t}$

5. $\dfrac{d}{dt}\, \ln(2+\sin t)$

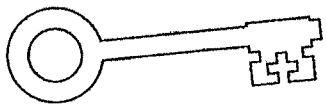
6. $\dfrac{d}{dt}\,(t+\cos t)^5$

7. $\dfrac{d}{dx}\, \cos^4(\sqrt{x})$

8. $\dfrac{d}{dx}\, \dfrac{e^x}{\sin x}$

9. Find $g'(1)$ where $g(x) = 2x\ln(x)$.

10. Find the slope of the tangent line to the graph of $y = 3t^2 - 1/t$ when $t = 2$.



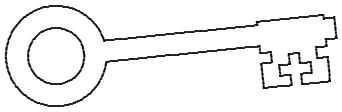
Calculus I

MATH 2200—Fall 2003

Sample #1—Gateway Exam—SOLUTIONS

It is *not* necessary to simplify your answers to Gateway Exam questions *except in the case of simple numerical answers.*

Question	Acceptable Answer	*Another* (Simplified) Acceptable Answer
1. $\frac{d}{dx}\left(3x^4 - 6x^{3/4} - \frac{\pi}{2}\right)$	$3\cdot 4x^3 - 6\cdot\frac{3}{4}x^{-1/4}$	$12x^3 - \frac{9}{2}x^{-1/4}$
2. $\frac{d}{dt}\sqrt[3]{8-4t^2}$	$\frac{1}{3}(8-4t^2)^{-1/2}(-8t)$	$-\frac{8t}{3\sqrt{8-4t^2}}$
3. $\frac{d}{dx}x^3\sin 5x$	$3x^2\sin 5x + x^3\cdot 5\cos 5x$	$3x^2\sin 5x + 5x^3\cos 5x$
4. $\frac{d}{dt}e^{t^2-3t}$	$e^{t^2-3t}\cdot(2t-3)$	$(2t-3)e^{t^2-3t}$
5. $\frac{d}{dt}\ln(2+\sin t)$	$\frac{1}{2+\sin t}\cdot\cos t$	$\frac{\cos t}{2+\sin t}$
6. $\frac{d}{dt}(t+\cos t)^5$	$5(t+\cos t)^4(1-\sin t)$	$5(t+\cos t)^4(1-\sin t)$
7. $\frac{d}{dx}\cos^4(\sqrt{x})$	$4\left(\cos^3\sqrt{x}\right)\left(-\sin\sqrt{x}\right)\cdot\frac{1}{2}x^{-\frac{1}{2}}$	$-\frac{2\cos^3(\sqrt{x})\sin(\sqrt{x})}{\sqrt{x}}$
8. $\frac{d}{dx}\frac{e^x}{\sin x}$	$\frac{(\sin x)e^x - (\cos x)e^x}{\sin^2 x}$	$\frac{(\sin x - \cos x)e^x}{\sin^2 x}$
9. Find $g'(1)$ where $g(x) = 2x\ln(x)$.	$g'(x) = 2\ln x + 2x\cdot\frac{1}{x}$ $g'(1) = 2\cdot 0 + 2\cdot 1 = 2$	$g'(1) = 2$
10. Find the slope of the tangent line to the graph of $y = 3t^2 - 1/t$ when $t = 2$.	$\frac{dy}{dt} = 6t - (-1)t^{-2}$ $\left.\frac{dy}{dt}\right\|_{t=2} = 12 + \frac{1}{4} = 12\frac{1}{4}$	$\left.\frac{dy}{dt}\right\|_{t=2} = \frac{49}{4}$



Calculus I

MATH 2200—Fall 2003

Sample #2—Gateway Exam

Name (Print) .....

Instructor/Section ..... **Date** .....

Instructions: Find each of the following. No aids are allowed.

1. $\dfrac{d}{dx}\cos\left(x^3\right)$

2. $\dfrac{d}{dt}\,4.3\ln(2.7t)$

3. $\dfrac{d}{dx}\dfrac{1}{\sqrt{x}+e^{2x}}$

4. $\dfrac{d}{dy}\left(\ln 3-\dfrac{7}{\sqrt[3]{y}}+7y^{3/2}\right)$

5. $\dfrac{d}{dx}\,\tan(\sin x)$

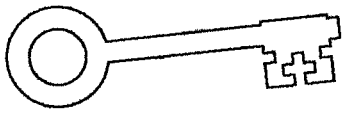
6. $\dfrac{d}{dx}\left(x^2-x+1\right)^9$

7. $\dfrac{d}{dx}\dfrac{x^2}{e^x+1}$

8. Find $g'(0)$ if $g(x)=2\sin\left(5x+\frac{\pi}{2}\right)$. (Express your answer in numerical form.)

9. $\dfrac{d}{dx}\,e^{-3t}\cos(4t)$

10. Find the slope of the tangent line to the graph of $y=3(2t-3)^5$ at $t=2$. (Express your answer in numerical form.)



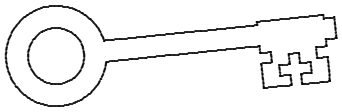
Calculus I

MATH 2200—Fall 2003

Sample #2—Gateway Exam—SOLUTIONS

It is *not* necessary to simplify your answers to Gateway Exam questions *except in the case of simple numerical answers.*

Question	Acceptable Answer	*Another* (Simplified) Acceptable Answer
1. $\frac{d}{dx}\cos(x^3)$	$-\sin(x^3)\cdot 3x^2$	$-3x^2\sin(x^3)$
2. $\frac{d}{dt}\,4.3\ln(2.7t)$	$4.3\frac{d}{dt}(\ln 2.7 + \ln t) = \frac{4.3}{t}$	$\frac{4.3}{t}$
3. $\frac{d}{dx}\frac{1}{\sqrt{x}+e^{2x}}$	$-(\sqrt{x}+e^{2x})^{-2}(\frac{1}{2}x^{-1/2}+2e^{2x})$	$-\frac{\frac{1}{2\sqrt{x}}+2e^{2x}}{(\sqrt{x}+e^{2x})^2}$
4. $\frac{d}{dy}\left(\ln 3 - \frac{7}{\sqrt[3]{y}} + 7y^{3/2}\right)$	$-7(-\frac{1}{3})y^{-4/3} + 7(\frac{3}{2})y^{1/2}$	$\frac{7}{3}y^{-4/3} + \frac{21}{2}y^{1/2}$
5. $\frac{d}{dx}\tan(\sin x)$	$\sec^2(\sin x)\cdot\cos x$	$\sec^2(\sin x)\cos x$
6. $\frac{d}{dx}(x^2-x+1)^9$	$9(x^2-x+1)^8(2x-1)$	$9(x^2-x+1)^8(2x-1)$
7. $\frac{d}{dx}\frac{x^2}{e^x+1}$	$\frac{(e^x+1)(2x)-x^2e^x}{(e^x+1)^2}$	$\frac{(2x-x^2)e^x+2x}{(e^x+1)^2}$
8. Find $g'(0)$ if $g(x) = 2\sin(5x+\frac{\pi}{2})$. (Express your answer in numerical form.)	$g'(x) = 10\cos(5x+\frac{\pi}{2})$ $g'(0) = 10\cos\frac{\pi}{2} = 0$	$g'(0) = 10\cos\frac{\pi}{2} = 0$
9. $\frac{d}{dt}e^{-3t}\cos(4t)$	$-3e^{-3t}\cos 4t - 4e^{-3t}\sin 4t$	$-e^{-3t}(3\cos 4t + 4\sin 4t)$
10. Find the slope of the tangent line to the graph of $y = 3(2t-3)^5$ at $t=2$. (Express your answer in numerical form.)	$\frac{dy}{dt} = 30(2t-3)^4$ $\left.\frac{dy}{dt}\right\|_{t=2} = 30\cdot 1 = 30$	$\left.\frac{dy}{dt}\right\|_{t=2} = 30$



Calculus I

MATH 2200—Fall 2003

Sample #3—Gateway Exam

Name (Print) .....

Instructor/Section ..... **Date** .....

Instructions: Find each of the following. No aids are allowed.

1. $\dfrac{d}{dx}\left(2x^{\pi} + \dfrac{5}{x^3} - 4x^{10}\right)$

2. $\dfrac{d}{dt}\,\sin(2\cos t)$

3. $\dfrac{d}{dx}\,e^{(x-5)^2/2}$

4. If $g(x) = (2x+1)(2x-1)$, find $g'(x)$.

5. $\dfrac{d}{dy}\,\dfrac{1}{\ln(25y)}$

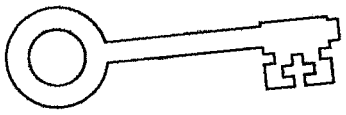
6. $\dfrac{d}{dx}\left(\dfrac{x-1}{x+1}\right)$

7. $\dfrac{d}{d\theta}\left(\theta\tan\theta\right)$

8. $\dfrac{d}{dx}\,\sqrt{1+\sqrt{x}}$

9. Find $f'\left(\frac{\pi}{4}\right)$ for $f(x) = 4\cos(2x)$. (Express your answer in numerical form.)

10. Find the equation of the tangent line to the graph of $y = x + x^{-2}$ at the point $(1, 2)$.



Calculus I

MATH 2200—Fall 2003

Sample #3—Gateway Exam—SOLUTIONS

It is *not* necessary to simplify your answers to Gateway Exam questions *except in the case of simple numerical answers.*

Question	Acceptable Answer	*Another* (Simplified) Acceptable Answer
1. $\frac{d}{dx}\left(2x^{\pi}+\frac{5}{x^3}-4x^{10}\right)$	$2\pi x^{\pi-1}+5(-3)x^{-4}-4(10)x^{9}$	$2\pi x^{\pi-1}-15x^{-4}-40x^{9}$
2. $\frac{d}{dt}\sin(2\cos t)$	$\cos(2\cos t)(-2\sin t)$	$-2\cos(2\cos t)\sin t$
3. $\frac{d}{dx}e^{(x-5)^2/2}$	$e^{(x-5)^2/2}\cdot\frac{2(x-5)}{2}$	$(x-5)e^{(x-5)^2/2}$
4. If $g(x)=(2x+1)(2x-1)$, find $g'(x)$.	$g(x)=4x^2-1$ $g'(x)=8x$	$g'(x)=8x$
5. $\frac{d}{dy}\frac{1}{\ln(25y)}$	$-(\ln(25y))^{-2}\left(\frac{1}{25y}\cdot 25\right)$	$-\frac{1}{y(\ln(25y))^2}$
6. $\frac{d}{dx}\left(\frac{x-1}{x+1}\right)$	$\frac{(x+1)-(x-1)}{(x+1)^2}$	$\frac{2}{(x+1)^2}$
7. $\frac{d}{d\theta}(\theta\tan\theta)$	$\tan\theta+\theta\sec^2\theta$	$\tan\theta+\theta\sec^2\theta$
8. $\frac{d}{dx}\sqrt{1+\sqrt{x}}$	$\frac{1}{2}(1+x^{1/2})^{-1/2}\left(\frac{1}{2}x^{-1/2}\right)$	$\frac{1}{4\sqrt{x}\sqrt{1+\sqrt{x}}}=\frac{1}{4\sqrt{x+\sqrt{x}}}$
9. Find $f'\left(\frac{\pi}{4}\right)$ for $f(x)=4\cos(2x)$. (Express your answer in numerical form.)	$f'(x)=-8\sin(2x)$ $f'\left(\frac{\pi}{4}\right)=-8\sin\frac{\pi}{2}=-8$	$f'\left(\frac{\pi}{4}\right)=-8$
10. Find the equation of the tangent line to the graph of $y=x+x^{-2}$ at the point $(1,2)$.	$\frac{dy}{dx}\Big\|_{x=1}=\left[1-2x^{-3}\right]_{x=1}=-1$ Tangent line: $y-2=-1(x-1)$ i.e. $y=-x+3$	$y=-x+3$