Classroom Voting Questions: Calculus I

3.5 The Trigonometric Functions

1. Find a sinusoidal function to model the water level resulting from the tides if we have high tide at 2am with a water level of $W = 32$ feet, and we have a low tide at 7am with a water level of $W = 8$ feet. Let us set time $t = 0$ at midnight.

   (a) $W(t) = 8 + 32\sin(t)$.
   (b) $W(t) = 8 + 32\cos(t - 2)$.
   (c) $W(t) = 12 + 20\cos(10(t - 2))$
   (d) $W(t) = 12 + 20\cos\left(\frac{\pi}{5}(t - 2)\right)$
   (e) $W(t) = 20 + 12\cos\left(\frac{\pi}{5}(t - 2)\right)$
   (f) $W(t) = 8 + 32\cos\left(\frac{\pi}{5}(t - 2)\right)$
   (g) $W(t) = 20 + 12\cos(20(t - 2))$
   (h) None of the above

2. $\frac{d}{dx}(-3\sin x)$ is

   (a) $\cos x$
   (b) $-3\sin x$
   (c) $3\cos x$
   (d) $-3\cos x$

3. $\frac{d}{dx}\frac{\cos x}{25}$ is

   (a) $(\sin x)/25$
   (b) $-\sin x$
   (c) $(-\sin x)/25$
   (d) $(-\cos x)/25$

4. $\frac{d}{dx}(10\sin(12x))$ is

   (a) $120\cos(12x)$
   (b) $10\cos(12x)$

(c) $120\sin(12x)$

(d) $-120\cos(12x)$

5. The 4th derivative of $\sin x$ is

   (a) $\sin x$

   (b) $\cos x$

   (c) $-\sin x$

   (d) $-\cos x$

6. The 10th derivative of $\sin x$ is

   (a) $\sin x$

   (b) $\cos x$

   (c) $-\sin x$

   (d) $-\cos x$

7. The 100th derivative of $\sin x$ is

   (a) $\sin x$

   (b) $\cos x$

   (c) $-\sin x$

   (d) $-\cos x$

8. The 41st derivative of $\sin x$ is

   (a) $\sin x$

   (b) $\cos x$

   (c) $-\sin x$

   (d) $-\cos x$

9. The 4th derivative of $\cos x$ is

   (a) $\sin x$

   (b) $\cos x$

   (c) $-\sin x$

(d) $-\cos x$

10. The 30th derivative of $\cos x$ is

(a) $\sin x$
(b) $\cos x$
(c) $-\sin x$
(d) $-\cos x$

11. If $f(x) = \frac{x}{\sin x}$, then $f'(x) =$

(a) $\frac{\sin x - x\cos x}{\sin^2 x}$
(b) $\frac{\sin x - x\cos x}{\cos^2 x}$
(c) $\frac{x\cos x - x\sin x}{\sin^2 x}$
(d) $\frac{\cos x - x\cos x}{\sin^2 x}$

12. $\frac{d}{dx}\sin(\cos x)$ is

(a) $-\cos x\cos(\cos x)$
(b) $-\sin x\cos(\sin x)$
(c) $-\sin x\sin(\cos x)$
(d) $-\sin x\cos(\cos x)$

13. If $f(x) = \sin x\cos x$, then $f'(x) =$

(a) $1 - 2\sin^2 x$
(b) $2\cos^2 x - 1$
(c) $\cos 2x$
(d) All of the above
(e) None of the above

14. If $f(x) = \tan x$, then $f'(x) =$

(a) $\sec^2 x$
(b) $\cot x$
(c) $-\cot x$

(d) All of the above

(e) None of the above

15. We know that $\frac{d}{dx}\sin x = \cos x$. **True or False:** $\frac{d}{dx}\sin(2x) = \cos(2x)$.
(a) True, and I am very confident
(b) True, but I am not very confident
(c) False, but I am not very confident
(d) False, and I am very confident

16. $\frac{d}{dx}\left(e^x \sin x\right)$ is

(a) $e^x \cos x$

(b) $e^x \sin x$

(c) $e^x \cos x + e^x \sin x$

(d) $e^x \sin x - e^x \cos x$

17. $\frac{d}{dx}\left(\sin\left(x^2+5\right)\right)$ is

(a) $\cos(x^2+5)$

(b) $\sin(2x+5)$

(c) $2x\sin(x^2+5)$

(d) $2x\cos(x^2+5)$

18. $\frac{d}{dx}\left(\sin^2(ax)\right)$ is

(a) $2\sin(ax)$

(b) $2\cos(ax)$

(c) $2a\sin(ax)$

(d) $2a\sin(ax)\cos(ax)$

19. $\frac{d}{dx}\left(\sin x + e^{\sin x}\right)$ is

(a) $\cos x + e^{\cos x}$

(b) $\cos x + e^{\sin x}$

(c) $\cos x + e^{\sin x}\cos x$

(d) None of the above

20. The equation of the line tangent to the graph of $\cos x$ at $x = 0$ is

(a) $y = 1$
(b) $y = 0$
(c) $y = \cos x$
(d) $y = x$

21. The equation of the line tangent to the graph of $2 \sin 3x$ at $x = \frac{\pi}{3}$ is

(a) $y = 6x - 2\pi$
(b) $y = 6x \cos 3x - 2\pi$
(c) $y = -6x + 2\pi$
(d) $y = -6x + 2\pi - 1$

22. Use linear approximation to estimate $\sin(6)$.

(a) $\sin(6) \approx 1$
(b) $\sin(6) \approx +0.28$
(c) $\sin(6) \approx 0$
(d) $\sin(6) \approx -0.28$
(e) $\sin(6) \approx 2\pi$
(f) $\sin(6) \approx \sin(6) - 0.28 \cos(6)$
(g) None of the above