

1. $\lim_{x \rightarrow 0} \frac{\sin 4x}{2x} = \lim_{x \rightarrow 0} \frac{2 \sin 4x}{4x} = \boxed{2}$ (A)

2. $f'(x) = \ln(x^x)$
 3 zero = 3 critical points
 (D)

3. $f(x) = \frac{x^2 - 4}{x + 2} = \frac{(x+2)(x-2)}{x+2} = x - 2$
 $f(-2) = \boxed{-4}$ (A)

4. $f(x) = x^4 + 2x^2$
 $f'(x) = 4x^3 + 4x$
 $4x^3 + 4x = 1$
 $4x^3 + 4x - 1 = 0$
 $x = -.237$
 $m = 1$

$y - .115 = x - .237$
 $y = x - .122$ (D)

5. $y = \sin x$
 $y' = \cos x$
 $\cos\left(\frac{2\pi}{3}\right) = -.5$
 $y - \frac{1}{2} = -.5\left(x - \frac{2\pi}{3}\right)$
 $y = -.5\left(x - \frac{2\pi}{3}\right) + \frac{1}{2}$
 Intersect at 5.388
 (C)

6. $v(t) = -4 \cos t - \frac{1}{2}t^2 + 10$
 $v'(t) = 4 \sin t - t$
 $v''(t) = 4 \cos t - 1$
 $1 = 4 \cos t$
 $\cos t = \frac{1}{4} \quad t = 1.318$
 $v'(1.318) = \boxed{2.55}$ (D)

$$9. V = \pi r^2 h = 16\pi$$

$$\Delta A = 2\pi r^2 + 2\pi r h$$

$$r^2 h = 16$$

$$r^2 = \frac{16}{h}$$

$$r = \frac{4}{\sqrt{h}}$$

$$\Delta A = 2\pi \left(\frac{16}{h}\right) + 2\pi \left(\frac{4}{\sqrt{h}}\right) h$$

$$= \frac{32\pi}{h} + \frac{8\pi\sqrt{h}}{h}$$

$$= \frac{-32\pi}{h^2} + \frac{8\pi}{2\sqrt{h}}$$

$$h = 4 \quad \text{(D)}$$

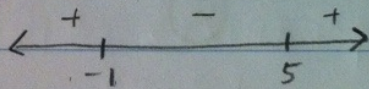
$$10. f(x) = x^3 - 6x^2 - 15x - 2$$

$$f'(x) = 3x^2 - 12x - 15$$

$$0 = 3(x^2 - 4x - 5)$$

$$3(x-5)(x+1)$$

$$x = 5, -1$$



(E)

$$11. f(x) = (x^2 + 2x - 1)^{2/3}$$

$$f'(x) = \frac{2}{3} (x^2 + 2x - 1)^{-1/3} (2x + 2)$$

$$f'(0) = \frac{2}{3} (-1)^{-1/3} (2)$$

$$= -\frac{4}{3} \quad \text{(D)}$$

$$12. 3x^2 + 2xy + y^3 = 2$$

$$6x + 2x \cdot \frac{dy}{dx} + 2y + 3y^2 \cdot \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} [2x + 3y^2] = -6x - 2y$$

$$\frac{dy}{dx} = \frac{-6x - 2y}{2x + 3y^2}$$

$$= \frac{-6(-1) - 2}{-2 + 3} = \frac{4}{1} = 4$$

$$y = -\frac{1}{4}x + b$$

$$4y = -x + b$$

$$x + 4y = b \quad \text{(A)}$$

$$13. y = \frac{ax+b}{x+c} \quad a=4$$

$$c=2$$

$$a+c=6 \quad (E)$$

$$14. \lim_{h \rightarrow 0} \frac{\sin(\frac{\pi}{2}+h) - \sin(\frac{\pi}{2})}{h}$$

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

$$f'(x) = \cos x$$

$$f'(\frac{\pi}{2}) = \cos(\frac{\pi}{2}) = 0$$

(B)

$$15. A = 2x(4-x^2)$$

$$A = 8x - 2x^3$$

$$A' = 8 - 6x^2$$

$$6x^2 = 8$$

$$x^2 = \frac{4}{3}$$

$$x = \frac{2 \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} = \frac{2\sqrt{3}}{3}$$

(D)

$$16. \text{All are true? (D)}$$

$$17. f(x) = \cos x$$

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

$$f''(x) = -\cos x$$

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

$$f^{(4)}(x) = \cos x$$

(A)

$$18. \frac{dS}{dt} = 10 \text{ cm}^2/\text{s}$$

Find $\frac{dV}{dt}$ when $x=10$

$$S = 6x^2 \quad x = \sqrt{\frac{S}{6}}$$

$$V = x^3$$

$$V = \left(\sqrt{\frac{S}{6}}\right)^3 = \frac{S^{3/2}}{6^{3/2}}$$

$$\frac{dV}{dt} = \frac{3}{2} \cdot \frac{S^{1/2}}{6^{3/2}} \cdot \frac{dS}{dt}$$

$$\frac{dV}{dt} = \frac{3}{2} \cdot \frac{(600)^{1/2}}{6^{3/2}} \cdot 10$$

$$\frac{dV}{dt} = (2.5)(10) = \boxed{25}$$