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A D A B B
B A B

HW #2

D 1. $f(x) = (x-1)(x^2+2)^3$

$f'(x) = (x-1)(3)(x^2+2)^2(2x) + (x^2+2)^3$

$f'(x) = (x^2+2)^2(6x(x-1) + (x^2+2))$

$f'(x) = (x^2+2)^2(6x^2-6x+x^2+2)$

$\boxed{f'(x) = (x^2+2)^2(7x^2-6x+2)}$

E 2. $f(x) = \cos(3x)$

$f'(x) = -\sin(3x)(3)$

$f'(x) = -3\sin(3x)$

$f'(\pi/9) = -3\sin(3 \cdot \frac{\pi}{9})$

$f'(\pi/9) = -3\sin(\pi/3) = -3 \cdot \frac{\sqrt{3}}{2} = \boxed{-\frac{3\sqrt{3}}{2}}$

B 3.

D 4. $f(x) = e^{2/x} = e^{2x^{-1}}$

$f'(x) = e^{2/x} \cdot -2x^{-2}$

$\boxed{f'(x) = \frac{-2}{x^2} e^{2/x}}$

A 5. $f(x) = x^2 + 2x$

$f(\ln x) = (\ln x)^2 + 2\ln x$

$f'(\ln x) = 2\ln x \cdot \frac{1}{x} + 2 \cdot \frac{1}{x}$

$f'(\ln x) = \boxed{\frac{2\ln x + 2}{x}}$

A 6. $x + y = k$, $y = -x + k$

$y = x^2 + 3x + 1$

slope must be -1

$y' = 2x + 3 = -1$

$2x = -4$

$x = -2$

If $x = -2$, slope is -2

$y(-2) = (-2)^2 + 3(-2) + 1 = -1$

point-slope form

$y - (-1) = -1(x - (-2))$

$y + 1 = -1(x+2)$

$y + 1 = -x - 2$

$y = -x - 2 - 1$

$y = -x - 3$ $\boxed{k = -3}$

D 7. $\sin(xy) = x$

$\cos(xy)[x\frac{dy}{dx} + y] = 1$

$x\cos(xy)\frac{dy}{dx} + y\cos(xy) = 1$

$x\cos(xy)\frac{dy}{dx} = 1 - y\cos(xy)$

$\boxed{\frac{dy}{dx} = \frac{1 - y\cos(xy)}{x\cos(xy)}}$

A 8. For the velocity to be increasing, it's derivative must be positive.

Since the graph given is position $x(t)$ I must remember:

$v(t) = x'(t)$

$a(t) = v'(t) = x''(t)$

so $x''(t)$ must be positive $\therefore$ $x(t)$ must be concave up.

B 9. $f(2)=1$ $\quad$ $y-1 = 4(x-2)$

$f'(2)=4$ $\quad$ At $x=1.9$, $y-1 = 4(1.9-2)$

$f''(2)=3$ $\quad$ $y = 4(-0.1)+1 = -0.4+1 = \boxed{0.6}$

B 10. If f is diff, it must be continuous.

$f(x) = \begin{cases} cx+d & x \le 2 \\ x^2-cx & x>2 \end{cases}$

$cx+d = x^2-cx$ when $x=2$

$2c+d = 4-2c$

$4c+d=4$

the derivatives must also be equal:

$c = 2x-c$ when $x=2$

$c = 2(2)-c$

$2c=4$

$c=2$

$4(2)+d=4$

$8+d=4$

$d=-4$

$c+d = 2+-4 = -2$

A 12. $f(3)=15$ $\quad$ $f'(3)=-8$

$f(6)=3$ $\quad$ $f'(6)=-2$

$g'(x) = \dfrac{1}{f'(g(x))}$

$g'(3) = \dfrac{1}{f'(g(3))} = \dfrac{1}{f'(6)} = \dfrac{1}{-2} = \boxed{-\dfrac{1}{2}}$

B 11. $y = \arctan(4x)$

$y' = \dfrac{1}{1+(4x)^2} = \dfrac{1}{1+16x^2}$

$y'(\frac{1}{4}) = \dfrac{1}{1+16(\frac{1}{4})^2} = \dfrac{1}{1+1} = \boxed{\dfrac{1}{2}}$

13. B

Calculator