FIVE MINUTE REVIEW FOR WEEK 2.

Question 1. *Factor* $4x^2 - 9$.

Answer 1.

$$4x^2 - 9 = (2x + 3)(2x - 3)$$

Question 2. *Simplify* $4(x^2 - x + 2) - 5(x - 1)^2$.

Answer 2.

$$4(x^2 - x + 2) - 5(x - 1)^2 = 4x^2 - 4x + 8 - 5(x^2 - 2x + 1) = 4x^2 - 4x + 8 - 5x^2 + 10x - 5 = -x^2 + 6x + 3$$

Question 3. *Simplify* $\frac{1}{x+1} + \frac{1}{x-1}$.

Answer 3.

$$\frac{1}{x+1} + \frac{1}{x-1} = \frac{x - 1 + x + 1}{x^2 - 1} = \frac{2x}{x^2 - 1}$$

Question 4. *Simplify* $(x^{-5}y^3z^{10})^{-\frac{3}{5}}$.

Answer 4.

$$(x^{-5}y^3z^{10})^{-\frac{3}{5}} = x^3y^{\frac{9}{5}}z^{-6} = \frac{x^3}{y^{\frac{9}{5}}z^6}$$

Question 5. *Solve* $10\theta^2 - e\theta + 10 = 0$.

Answer 5.

$$\theta = \frac{e \pm \sqrt{e^2 - 400}}{20} = \frac{e \pm \sqrt{(e - 20)(e + 20)}}{20}$$

Question 6. *Calculate* $\frac{d}{dx}((x - 2)^3)$.

Answer 6.

$$\frac{d}{dx}((x - 2)^3) = 3(x - 2)^2$$

Question 7. *Calculate* $\frac{d}{d\theta}(\log(\cos\theta))$.

Answer 7.

$$\frac{d}{d\theta}(\log(\cos\theta)) = \frac{-\sin\theta}{\cos\theta} = -\tan\theta$$

Question 8. *Calculate* $\frac{d}{dt}\int_{\sqrt{2}}^{t} e^{\sin(s^2)}ds$.

Answer 8.

$$\frac{d}{dt}\int_{\sqrt{2}}^{t} e^{\sin(s^2)}ds = e^{\sin(t^2)}$$

Question 9. *Calculate* $\frac{d}{dx}(\arcsin(x^2))$.

Answer 9.

$$\frac{d}{dx}(\arcsin(x^2)) = \frac{2x}{\sqrt{1 - x^4}}$$

Question 10. *Calculate* $\frac{d}{dx}(x^2\log(x))$.

Answer 10.

$$\frac{d}{dx}(x^2\log(x)) = 2x\log(x) + x$$

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Question 11. *Calculate* $\int_0^{\phi} \frac{d\theta}{\cos^2\theta}$.

Answer 11.

$$\int_0^{\phi} \frac{d\theta}{\cos^2\theta} = \tan\phi$$

Question 12. *Calculate* $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \cos\theta e^{\sin\theta} d\theta$.

Answer 12.

$$\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \cos\theta e^{\sin\theta} d\theta = \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \frac{d}{d\theta}(e^{\sin\theta}) d\theta = e^{\sin\frac{\pi}{2}} - e^{\sin\frac{\pi}{4}} = e - e^{\frac{1}{\sqrt{2}}}$$

Question 13. *State the Fundamental Theorem of Calculus.*

Answer 13. (a) Let f be integrable on $[a,b]$, and define a function F on $[a,b]$ by

$$F(x) = \int_a^x f(t)dt.$$

If f is continuous at $c \in [a,b]$, then F is differentiable at c, and

$$\frac{dF}{dx}(c) = f(c).$$

(b) If f is integrable on $[a,b]$ and $f(t) = \frac{dg}{dt}$ for some function $g(t)$, then

$$\int_a^b f(t)dt = g(b) - g(a).$$

Question 14. *Calculate* $\int_2^8 \frac{du}{u+1}$.

Answer 14.

$$\int_2^8 \frac{du}{u+1} = [\log(u+1)]_2^8 = \log(9) - \log(3) = \log(3)$$

Question 15. *Calculate* $\int_{-\sqrt{3}}^{+\sqrt{3}} \frac{\sin(x)}{x^4+1} e^{3x^2} dx$.

Answer 15. The integrand is an odd function of x, so

$$\int_{-\sqrt{3}}^{+\sqrt{3}} \frac{\sin(x)}{x^4+1} e^{3x^2} dx = 0.$$